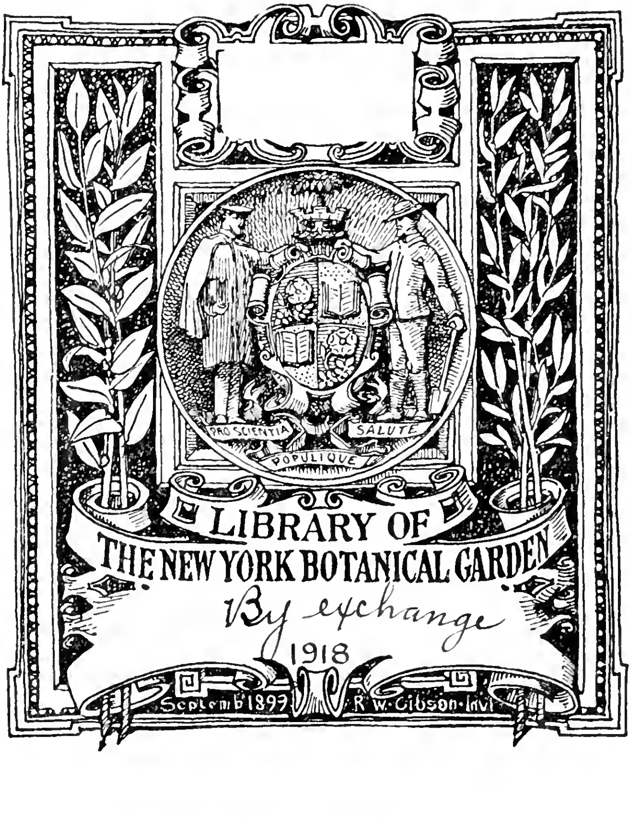
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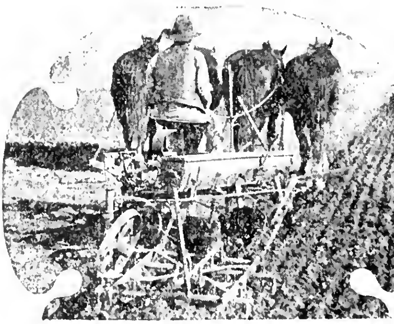

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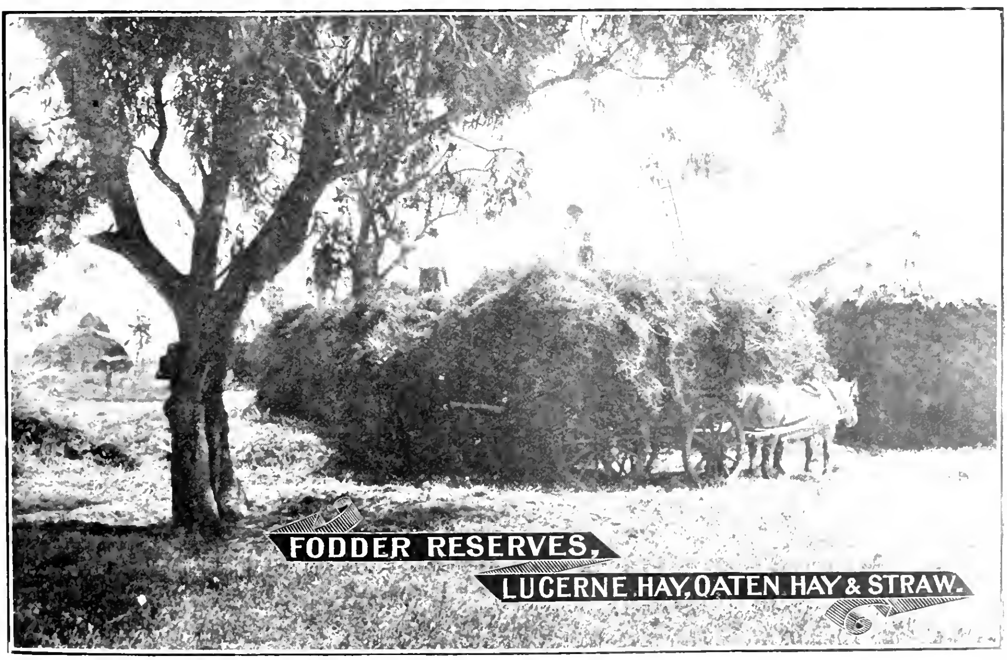

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OF

THE DEPARTMENT OF AGRICULTURE,

VICTORIA, AUSTRALIA.

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THE JOURNAL

OF

The Department of Agriculture

OF

VICTORIA.

Vol. XVI. Part 1. 10th January, 1918.

LONGERENONG AGRICULTURAL COLLEGE.

Fourth Annual Field Day.

INCREASED INTEREST SHOWN IN THE WORK.

Practical Application of Scientific Method.

(Abridged from the *Wimmera Star.*)

A large and representative gathering of farmers assembled at Longerenong College on Saturday, 24th November, to inspect the experimental work which is being carried out at the institution. When the first field day was held some four years ago, it was not contemplated that its influence and popularity would extend so rapidly. Not only has there been an increasingly large gathering each year, but many of the farmers travelled considerable distances to be present. There were men present from Dimboola on the west, Murtoa and Lubeck on the east, Toolondo on the south, and Pimpinio on the north. The weather was threatening, and the high winds raged all the afternoon, yet upwards of 200 farmers attended the gathering. It was a prosperous-looking gathering, and the fleet of fine motor cars standing along the whole length of the plots spoke volumes for the prosperity of the Wimmera.

The visitors assembled at the entrance of the stud cereal field, where they were welcomed by Mr. A. C. Drevermann, Principal of the College. The Mayor of Horsham (Mr. S. G. Knight) introduced Mr. A. E. V. Richardson, Agricultural Superintendent of the Department of Agriculture, who took the visitors in hand, and explained the objectives of the field experiments.

Mr. Richardson stated that the experiments in progress comprised the following investigations:—

(1) Permanent fertiliser trials.
(2) Permanent rotation tests.
(3) Rate of sowing and time of seeding trials.
(4) Variety of wheat trials.
(5) Selection plots.
(6) Crossbred wheat plots.

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The permanent rotation plots were commenced in 1917, and were designed to test the merits of eight different systems of crop rotation, of which only two are at present practised in the district. It was really a comparative test of eight different systems of farming. Twenty-three plots, each of half an acre, were devoted to this section. The plots were designed to test whether the cropping capacity of the land could not be increased by more frequent cropping, and the adoption of rotations suited to the changing economic condition of the district. Sheep were becoming more and more valuable, and the time was now rapidly approaching, if it had not already come, when it would pay to grow forage crops for feeding off with sheep. Such practices would increase the fertility of the soil, increase the stock-carrying capacity of the farm, and should result in higher average yields per acre. We had confined our attention almost exclusively to wheat. It had paid well, but the rise in the price of animal products would gradually lead to an alteration in the existing method of crop rotation—wheat, pasture, bare fallow.

The rotations which were being tested at present were the following:—

(1) Wheat continuously.
(2) Wheat after bare fallow.
(3) Wheat, pasture, bare fallow.
(4) Wheat, barley, pease.
(5) Wheat, oats, pease.
(6) Wheat, oats, bare fallow.
(7) Wheat, oats, pasture, bare fallow.
(8) Wheat, rape, barley, pease.

Farmers would note that barley and pease were introduced into these rotations. Barley was a very hardy crop, and would thrive in the very driest areas. It was a quick-growing cereal, and would always give 50 to 75 per cent. higher yields than wheat, given equal cultivation. There was, however, no regular export trade for barley, but the surplus barley of the Mediterranean countries was eagerly bought by Great Britain, and there could be no doubt that, after the war, an export trade would be developed in barley. It could be sown late, and it made excellent grazing for sheep, was always a reliable crop, and gave heavy yields of grain. Yields of up to 70 bushels per acre had been obtained from the College soil. It made excellent silage, and they would see later in the afternoon two silos filled with barley ensilage. Over 12 tons per acre of silage was obtained from the barley crop this year. Barley seemed fitted to be the great stock food of Victoria, corresponding to the maize crop of the United States, over 2,000,000,000 bushels of which were fed annually to live stock. The six-rowed Cape barleys gave the greatest yield per acre, but the two-rowed malting types were the most valuable from the maltster's point of view.

It would be noted that peas were introduced into these rotations. Peas were a most valuable crop, mainly because of their renovating effect on the soil, and the fact that they assimilated nitrogen from the air and stored it up in the soil for the use of subsequent crops. It was proposed to feed these pea crops down with sheep when the peas had formed grain. This would enable the harvesting to be done with the

minimum of cost. With some of the rotations, the fertility of the soil would increase year by year. With others, the fertility would be depleted. The results from these tests would become more and more interesting every year, because the effect of the rotation would be reflected in the yields of wheat obtained from each.

Passing on to the permanent fertiliser plots, Mr. Richardson said that four years' results had now been obtained. The results showed that superphosphate was the most effective of all the phosphatic manures—more effective than basic slag, bonedust, or a mixture of basic slag and super. By means of a blackboard, he showed the following results:—

Treatment.	Average yield for 4 years.	Increase over Unmanured Plot.	Value of Increase over Unmanured Plot.	Net Profit per acre over Unmanured Plot.
	Bushels.	Bushels.	£ s. d.	£ s. d.
(1) No manure ..	22·8	..	..	..
(2) Super., ½ cwt. ..	28·9	6·1	1 4 6	1 2 6
(3) Super., 1 cwt. ..	30·6	7·8	1 11 0	1 6 0
(4) Super., 2 cwt. ..	32·4	9·6	1 18 6	1 8 6

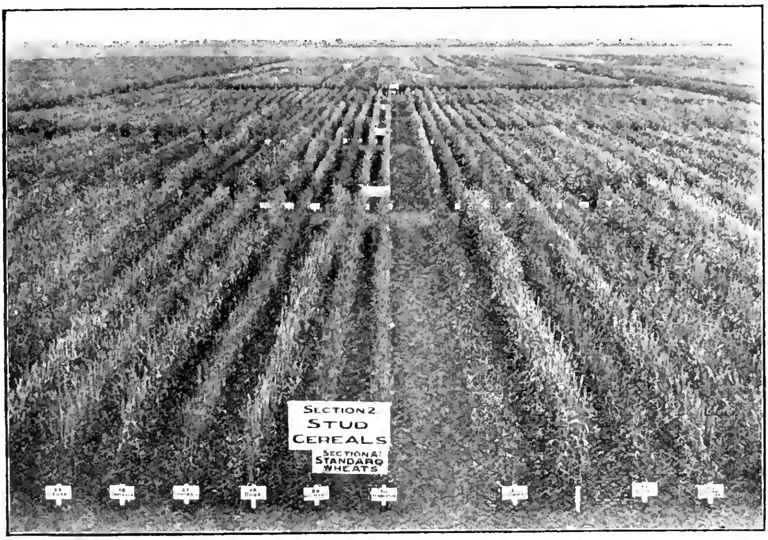
It would be seen that at Longerenong, over a period of four years, the average increase of the ½-cwt. plot over the unmanured plot was 6.1 bushels, worth, at 4s. per acre, 24s. 6d., and the net profit, after deducting the value of the fertiliser, was 22s. 6d. Similarly, the 1-cwt. plot gave a net increase of 7.8 bushels over the no-manure plot, worth 31s. per acre, and the net profit over and above the unmanured plot was 26s. per acre. The highest gross and net return was obtained by the 2-cwt. dressing.

These results showed conclusively that liberal dressings of fertiliser were more profitable than lighter applications, and that it would pay farmers in the district to fertilise more liberally than they had hitherto done. Here, at the College, the regular practice was to sow 1 cwt. of super. per acre over the whole farm area, and the yield of the crops during the past three years had certainly been justified by results. There was no danger from liberal dressings of fertiliser on the Wimmera soils, for they were well charged with lime, and could stand heavier dressings than country devoid of that ingredient. There was an added advantage from the liberal dressings, inasmuch as the stock-carrying capacity of the farm was increased, because of the indirect effect of the fertiliser in stimulating the natural herbage in the year the land was lying in pasture. Heavy dressings of fertiliser meant big crops of wheat, and heavy growth of herbage on the stubbles following the wheat, which meant more sheep could be kept and bigger returns per farm.

Mr. Richardson pointed out that neither nitrate of soda, sulphate of potash, nor lime, either singly or in combination, appeared to be required on Wimmera soils. This was a decided advantage, for these fertilisers were somewhat costly in application. Farmyard manure gave excellent returns, and in wet seasons there was no manure that could approach it. It was, however, particularly suitable to wet soils.

and the moister districts. The results of the tests showed that in dry seasons it tended to make the wheat too flaggy, and depress the yield. Considerable interest was manifested in the rate of seeding trials, and the time of sowing tests. There were twenty-four plots in this section. Federation wheat was sown in June at the rate of 30, 45, 60, 75, 90, and 120 lbs. per acre. Another series of plots, with the same dressings, were sown in mid-July.

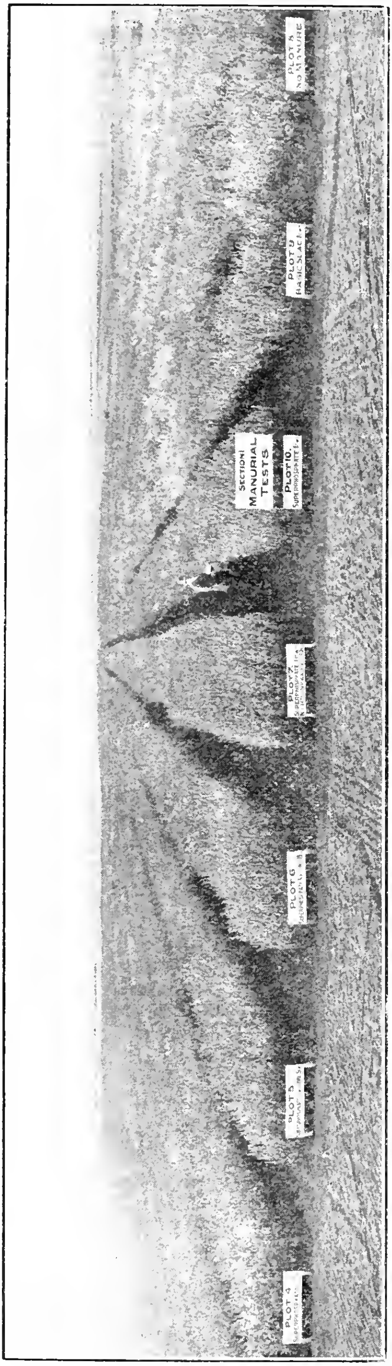
It was pointed out that, with early sowing, the best results were obtained by seeding at the rate of 60 to 75 lbs. per acre, whilst the late sowing, as much as 75 to 90 lbs. were required per acre to give the same stooling and the same yield. It was noted that, with the lighter seedings, the heads were well developed, but scanty, but with the heavier seedings the heads were puny, but very numerous.



View of Stud Cereal Section. Experimental plots. Longerenong Agricultural College.

Many farmers stated that it would be very difficult to say which of these series of plots would yield best. This explained the necessity of getting the absolute yields with the harvester to determine finally which rate of seeding relative to time of sowing gave the best returns. In this same section, two early, two mid-season, and two late-maturing wheats were sown early in June, and another series of the same wheats sown in mid-July. Here, again, there were remarkable divergences in appearance of crop, and in probable yield.

In the variety wheat section, consisting of $\frac{1}{2}$-acre blocks of different varieties, were some new crossbreds which have done well in field tests at the College. Bobs and Federation, Clubhead and Yandilla King, Indian F and Comeback, Redskin and Yandilla King, looked particularly promising, and the future performances of these will no doubt be watched with great interest.



View of Permanent Fertilizer Plots. Longerenong Agricultural College.

The section which awakened the greatest interest among the farmers was the selection and crossbred section.

Mr. Richardson congratulated the Horsham Agricultural Society on its progressive work in establishing wheat selection competitions for farmers. There were ten entries this year, and it was hoped that the inauguration of these wheat selection competitions would lead to a much greater interest in the value of selection as a means of improving the yielding capacity of our wheats. In the selection and crossbred plots were seen a number of new crossbreds undergoing trial preparatory to their cultivation on large plots. They were grown side by side with such favorites as Federation, Yandilla King, Dart's Imperial. In these plots, selected barleys—Oregon, Squarehead, Shorthead, Cape, Pryor, Gisborne, and Kinver. Pryor was decidedly the best of the two-rowed malting types, being remarkably early, with plump grain, and remarkably thin in the skin. Of the six-rowed Cape types, Oregon showed out to advantage. These barleys gave promise of heavy yields, but in places, owing to weakness of straw, they were lodging. It was pointed out that this could be partly corrected by later sowing and the choosing of types suited to resist lodging. Considerable interest was manifested in a natural cross between two-rowed bearded barley and six-rowed skinless. The crossbred type possessed two rows of grain like the pollen parent, and was bald like the ovule parent.

The long rows of crossbreds undergoing fixation preparatory to trial in field plots created the

greatest interest. Mr. Richardson explained in simple language the manner in which wheats were crossed, and the way in which the characters of the parent were transmitted to the progeny. In the second generation, or the "variable generation of the crossbred," every possible combination of characters in the two parents tended to

"Prosperity in the Wimmera."
Portion of group of forty-five motor cars assembled at College Oval.

Visitors arriving at Experimental Plots.

appear in the progeny. The task of the breeder was to isolate the most promising types; cultivate them separately, and test them side by side with the most prolific types. If one could judge by appearances,

there can be no doubt that many valuable crosses are awaiting exploitation. The visitors passed through these crossbred plots, closely examining the numerous promising types in the second, third, and fourth generation.

Mr. Richardson explaining Methods of Cross-breeding Wheat.

A Lecturette at the Manurial Plots.

During the course of discussion, the subject of takeall in wheat was brought up. It was pointed out that the disease was very prevalent in the Wimmera this year. It was caused by a fungus, but the fungus, unlike smut, could not be cured by pickling, because it attacked the wheat plant after it had made considerable growth. It may kill the plant outright before the heads are formed. That was takeall. Or the

plant may form heads without grain. That stage of the disease was called "whiteheads." Both "takeall" and "whiteheads" were phases of the one disease. The only cure was a good system of rotation, and using oats in the rotation. Oats are immune from attack, but barley grass and certain natives harbor the disease. The best cure for takeall land was:—(1) Burning the stubble of the affected crop. (2) Fallowing the land, and keeping the fallows clean from native grasses which harbored the pest. (2) Sowing an immune crop like oats. (4) Follow the oats with a bare fallow preparatory to sowing wheat.

SPEECHES.

An adjournment was made to the College buildings, where, in the main class-room, afternoon tea was served. The crowd filled the large room. Mr. P. Learmonth, president of the Horsham Agricultural Society, rose, and after honouring the toast of "The King," proposed a hearty vote of thanks to Mr. Richardson for the very instructive demonstration to which they had been treated. He said that more and more the farmers of the district were learning to value the experimental work done here and elsewhere in their interest, and to-day many were putting into practice the lessons that they learned, and were already reaping substantial monetary benefit by so doing. He was sure that many instructive lessons had been learned that afternoon, both by the farmers and by others interested in farming, which showed them that still greater wealth could be won from this wonderful fertile Wimmera. The society which he had the honour to represent were endeavouring by every means in their power to foster the spread of advanced methods among the farmers in this district, and that their efforts were already bearing fruit was shown by the active interest that was being taken in the carrying out of the new selection competition, for which there were ten competitors. The suggestion out of which that competition sprang was thrown out at a similar gathering a couple of years previously by Mr. Richardson. These things took time and trouble, but they were worth it. He had much pleasure in moving a hearty vote of thanks to Mr. Richardson, and hoped that that gentleman would visit them on many a similar occasion in the future. (Applause.)

Mr. Richardson, rising to respond, said that he thanked Mr. Learmonth and those present for the very hearty vote of thanks accorded him, but affirmed that his part in the proceedings was light compared with that of the quiet, steady effort of the staff of the College, which had really loaded the gun that he had fired. To Mr. Drevermann, Mr. Munro, and Mr. McTaggart, much of the credit was due; but there was one present in the room who had laboured unceasingly in previous years, and by that labour had paved the way for the present satisfactory results. He referred to Lieutenant Ivan Tulloh, who two years ago laid down the hoe for the entrenching tool. The same quiet, painstaking and thorough qualities that distinguished Field Officer Tulloh's work on the plots showed out in his military record in Gallipoli and France as a private, then as Sergeant, then as Lieutenant, and was evidenced further in the honorable scars of battle he bore. He hoped Lieutenant Tulloh would come back to them to carry on the work. (Cheers.)

Mr. Rodgers, M.H.R., proposed the toast of "The College." He said a great change had come over the institution in recent years, and, indeed, in the conduct of agricultural training and experimental work in the State generally. That change, he maintained, had been brought about by the men at the head of agricultural matters, and by the loyal co-operation of their staffs. He referred to Dr. Cameron, Director of Agriculture, and to Mr. Richardson, the Agricultural Superintendent. There were none of the old-time, dress-suit methods with them. They went to work with their coats off. They got right next to the farmer, and that was what was wanted. He asked those present to do all in their power to support this good work. If it was good, it was worth fighting for. He ventured to say that the Wimmera plains were the finest wheat belt in Australia. Their prominent position had been brought about by three factors—(1) the soil, (2) the men of the right temperament, (3) the loyal co-operation of scientific agriculture. The soil was a veritable gold mine, but it had only been partially exploited. Its further development rested on what aid science could give it, and that was a great deal. He noted five other returned soldiers in the room, and extended them a hearty greeting. (Applause.)

Mr. Drevermann, responding, said that it gave him great pleasure to see such a large and influential gathering present. He liked people to come and visit the place. He appreciated both their sympathy and their honest criticism—both were helpful. He welcomed visitors at all times. He came here six years ago, and had been steadily at work, loyally supported by the staff. They could see the result for themselves. There were many new buildings, and, he was proud to say, an air of businesslike prosperity about the place. Much remained to be done, but it was most satisfactory to see such a large and enthusiastic gathering there that day. It gave them fresh courage to go on with the work. On behalf of the staff and himself, he again thanked them.

The Mayor of Horsham, Cr. Knight, speaking on behalf of the visitors, spoke in glowing terms of what they had all seen that day, and in a spirited address supported all that Mr. Rodgers had said.

INSPECTION OF THE FARM.

The visitors then inspected the farm buildings and live-stock, under the guidance of the Principal (Mr. Drevermann) and the Farm Manager (Mr. Munro). Considerable improvements have been effected in the farm buildings during the past three years. The stable is being extended to accommodate twelve more horses. A new feed-house for the dairy cattle has recently been erected. Two silos have been filled with barley ensilage. Berkshire and Yorkshire pigs looked comfortable and well-housed in the pig-sties. In the dairy the milk records, giving the weight of milk of each cow and the percentage of butter fat in the milk of each, roused attention. Not the least interesting was the fine stamp of lads undergoing training to become the producers of the future. Forty lads are in attendance, and this is the maximum accommodation that has been provided. The visitors spent the best part of four hours in making an inspection of the plots and buildings; and, judging by the many expressions of appreciation, the afternoon was most enjoyable and instructive for the farmers of the district.

THE ROAD TO SUCCESS IN DAIRY FARMING.

By J. S. McFadzean, Senior Dairy Supervisor.

Here in Australia as in most other countries there is a general tendency for the rising generation to leave the country districts in order to seek employment in the cities. Yet the normal man desires an outdoor life, and undoubtedly many of those who now live in the city would exchange the "cribbed, cabined and confined" way of their daily routine for the freedom of country life, if only they were sure that agriculture could be made profitable.

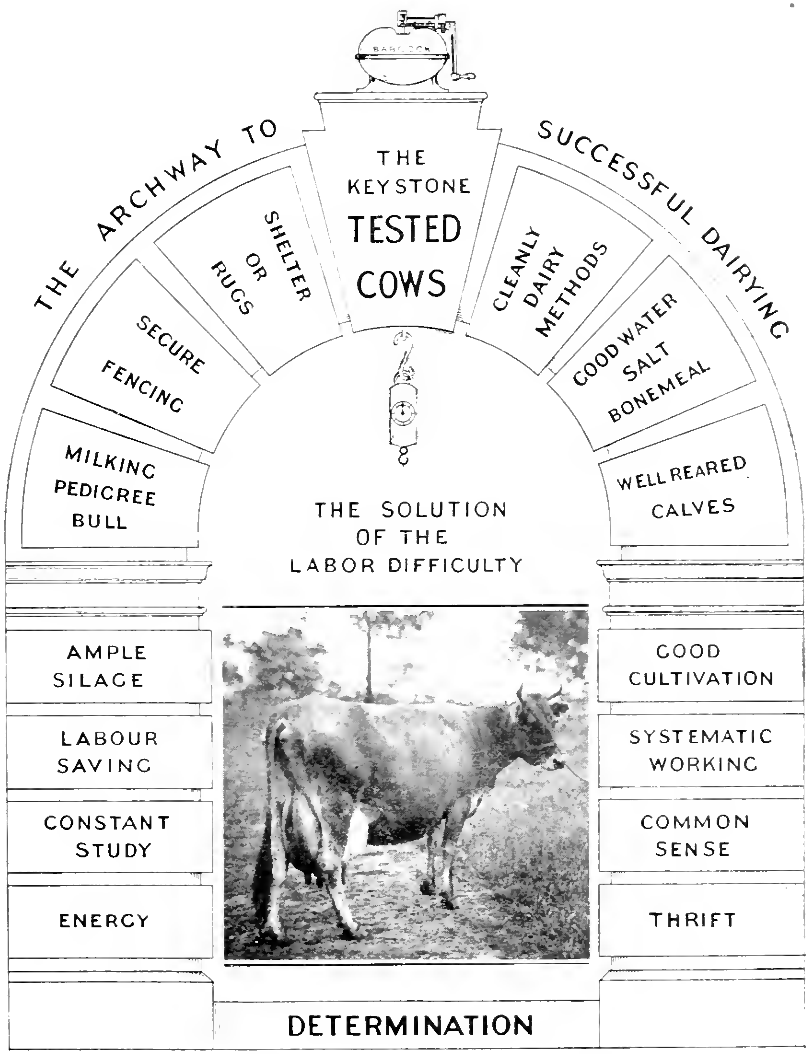
No one who has given consideration to the question will dispute that the wealth of the State depends on the rural workers. As a class, farmers, graziers, orchardists, &c., are a wealthy as well as wealth-producing people, though, of course, many following these occupations will never attain financial success. Still it is the individual and not the occupation that is usually to blame if the rural venture proves a failure. The energetic, thoughtful man will succeed in whatever branch of agriculture he takes up, just as the indolent or indifferent worker is almost doomed to failure.

It is comparatively easy to get a small start in dairy-farming, consequently every year a number of people take up this branch of agriculture. Some succeed; some drift along just barely keeping afloat on the financial tide; some fail. Failure is in a few instances caused by misfortune; but more often non-success arises from the idea that the business is a simple one, and consequently the beginner does not set to work to learn it in a sufficiently determined manner.

For the recruit in dairy-farming there is much work for both his brain and hands. The occupation calls for a close study of a wide range of subjects in all of which a good practical, as well as theoretical, knowledge is essential to success. The symbolic archway illustrated here will be found useful to remind, not only the beginner, but many an older dairy-farmer also, of building-stones which must not be left out of his business.

A good foundation is an absolute necessity for every project, and the dairy-farmer will find that a *determination* to succeed will carry him to his objective. The individual lacking persistency is very apt to fail in any business, as misfortune usually falls to every one at some time; but to those blessed with determination the setbacks of fortune serve to develop latent resources, and result in the successful grappling with trouble. On this foundation *energy* and *thrift* are next required. That energy is essential will soon be recognised; and, as dairy-farming is a business which sometimes demands a daylight-till-dark seven-days-in-the-week attention, the lazy man does not stop long at it. Energy, thrift, and the dairy herd have saved many a farm from financial disaster, while laziness and waste have as often resulted in the loss of both herd and farm. Thrift is the judicious husbanding of resources until necessity calls for their use, but it is a qualification that is too often confounded with meanness or parsimony. Good management requires that thrift be shown by never using up money or fodder unnecessarily, but on the other hand parsimony must on no account be allowed to prevent the proper feeding or housing of the stock.

The value to the farmer of a *constant study* of all matters pertaining to his business cannot be overestimated, for it brings to him a knowledge


THE ARCHWAY TO SUCCESSFUL DAIRYING
THE KEYSTONE
TESTED COWS
MILKING PEDIGREE BULL
SECURE FENCING
SHELTER OR RUGS
CLEANLY DAIRY METHODS
GOOD WATER SALT BONEMEAL
WELL REARED CALVES
THE SOLUTION OF THE LABOR DIFFICULTY
AMPLE SILAGE
LABOUR SAVING
CONSTANT STUDY
ENERGY
GOOD CULTIVATION
SYSTEMATIC WORKING
COMMON SENSE
THRIFT
DETERMINATION

of advanced methods of feeding, breeding, and care of stock, and may further result in much saving of labour through more systematic working. It should, however, be remembered that all published theories have not passed through the test of practical application, and consequently the dairyman must use *common sense* in his studies, so that only the useful material may be taken into account.

Systematic working is a powerful factor to success in dairy-farming. Long as the days are, time must not be wasted. Everything should be made as convenient as possible for the work, and advantage taken of every natural facility in the location. All stock are surprisingly regular in their habits, and consequently regularity in their feeding and handling suits them, and may be turned to some little advantage in time saving. Left to themselves, cattle generally graze over certain areas, drink, and rest at fairly regular hours, and the regular milking hour will usually find the cows at hand each day; especially if stall-fed at milking it will very seldom be necessary to go for them. By working to regular hours and on a definite system there is little chance of any work being neglected or temporarily overlooked. Systematic working is the greatest labour-saving proposition ever devised.

Good cultivation and *silage storage* are inseparable from good dairy-farm management. Both must be part of the system, each helping the other, and both assisting in building the archway to success. Nothing will clean the land of weeds so quickly as harvesting the crop to the silo before weed seeds are shed; and once in the silo there is no danger of the seeds germinating afterwards, as with hay or chaff fed to stock. The silo turns the weeds into fodder, and there is an end to them. The full silo, as well as haystack, are possible on almost every Victorian dairy farm, and no risk should be taken by allowing an unfavorable season to find the reserve supply short. In time of drought, silage has no monetary equivalent. The dairyman with silage knows so well its value, and how nutritious it is for the stock, that money cannot buy it from him. A full silo is the best investment a dairy-farmer ever has. The basis of milk production is an ample fodder supply. The stock must be always well fed if they are to milk well. To allow dairy cows to get low in condition at any time will result in a reduced annual milk yield from them. To overfeed stock is to waste fodder, but to underfeed is the worst of bad management.

The advisability of keeping only bulls that are both pure bred and from first class dairy stock is now generally recognised, and breeders having young bulls of this class have no difficulty in disposing of them at satisfactory prices. By breeding heifers from stock of good milking ancestry it is possible to increase each year the production of the herd, but the bull used must be the best possible obtainable. Nothing but the best should satisfy the progressive farmer, and no bull should be disposed of until it is possible to obtain a better one. An increased annual yield of milk or butter—or both—will result from the judicious selection of a *milking-pedigree bull*, and this section of the archway is absolutely indispensable.

All *fencing* on the farm must be kept in good repair or much trouble through loss of time and damage to crops and stock will occur. A neighbour's bull mixing with the herd may seriously interfere with the season's breeding programme, while there is also the possibility of either owner's bull being injured through fighting. Recovery of straying stock

may also take up valuable time, and usually more time is lost in such unnecessary work than would have been required to repair the fencing in the first place, and the fence must eventually be put in order. Half-an-hour on repairs may save hours, or even days, of work later on. Crops are only safe from stock when behind secure fencing, for if cattle once find they can break through a fence they do not fail to try again.

As indispensable adjuncts to a good food supply, *good water, salt,* and *bonemeal* should always be within handy access of the cattle. Good water near at hand makes for the comfort of the stock; and, particularly with heavy milking stock, it is very important that the cows should not have to travel far for water, or hustle with others of the herd to get their fill. Further, where cows have to wade through mud to reach the drinking water, chapped teats and otherwise injured and dirty udders will result, which makes for loss of time in the milking shed; and if the dirt gets into the milking bucket the quality of the produce will also be affected. It is far more preferable to keep the cows clean than to use up time and labour in washing off mud before each milking. Where the udders, flanks, and tails of the milking herd are allowed to become fouled with mud, dust, or other dirt, it is almost impossible to produce clean good-keeping milk.

If there is not a natural supply of salt, as in brackish water, it is necessary that salt as well as bonemeal should be kept where the cattle can get to it frequently. The clean, white, steamed, and crushed bone should be obtained for this purpose, and not the bonedust that is sold for manure. Salt and bonemeal have special value as aids to digestion, and particularly when the pastures are dry.

Unless a dairy-farm is very favorably situated in regard to natural shelter, such as may be provided by hedges or low-branched trees, it will prove an economical policy to *rug* or *house the milking herd* in the colder winter weather. Rugging has an advantage over housing in that the stock may be also kept comfortable outside on the grazing paddocks during the day, when rain or cold wind would otherwise drive them to seek shelter. Rugged stock keep in better condition on a given quantity of feed than those not similarly cared for, and are thus able to uphold a good flow of milk during the cold months, when dairy produce is highest in price. Care of the milking herd is always profitable to the farmer.

That there is a practical necessity for reasonable *cleanliness in dairy work* is not universally recognised by those entering into this business. The majority of people are fairly careful in the general handling of food, but there are some who are extremely careless in their treatment of food products, whether intended either for use by themselves or by others, and such dairy-farmers are a continual source of trouble to those who have to retail and use their produce. The keeping quality of both milk and cream is greatly impaired by contamination with any form of dirt, as souring quickly ensues, and its market value is consequently reduced. In either cheese-making or butter-making the factory manager looks for milk or cream to reach him in as fresh, clean, and cool a state as possible, so that he may have a chance to make good produce therefrom. Inferior-quality milk or cream will not make into good cheese or butter, and its market value is, in consequence, not the highest. The farmer who consistently supplies milk or cream to the consumer, retailer, or factory in a fresh, clean, and cool condition will always command a higher price

for his produce than those who sell inferior-keeping produce. His gain may not be more than from a halfpenny to a penny per gallon of milk or pound of butter fat, but even this reward of cleanliness amounts to a fair sum in the course of the year. It is in the flush season, when milk and cream are plentiful, that the careful farmer receives the greatest benefit, for his produce is then in demand. The careless or dirty farmer usually persuades himself that he is getting just as much for his produce as those do who exercise more care in its handling; but the buyers of dairy produce are keen business men, and have just as many opportunities of equalizing matters as buyers of other goods. An occasional can of milk or cream, returned for being sour or otherwise deteriorated, may easily be forgotten by the producer, and its loss will make a difference of a penny per gallon on several consignments, but it is not the careful farmer who loses in this way. The careless man deludes himself badly on this subject. He pays, and pays heavily, for dirty, slovenly work, because pennies lost soon amount to pounds. Cleanliness in dairy management is an essential building stone in the archway to success.

In fact, every stone shown in this figurative archway is of equal importance, for none can be left out without endangering the construction. Careful attention to every section will make the perfect structure, but the one that is, above all, most indispensable, and in which every care should be taken to make it perfect, is the centrepiece, or keystone—the tested dairy herd.

The question of on what minimum-yield basis dairy cows should be culled is one every farmer should answer for himself. It is a matter of actual cash returns over the cost of production. What is the return from each cow per year, and what does it cost to produce it? The returns are shown in actual cash received; in the expenditure should be included the cost of grazing, cultivation, fodder purchased, calf food, labour of milking, delivery of produce, and upkeep of farm plant. The net income will show the farmer the financial result. The testing of his herd will show him which cows are bringing in a reasonable return, and those which he is wasting time and money in keeping. One point, however, should be borne in mind by all, viz., that 500 gallons of milk, or 200 lbs. of butter fat, per cow per year can be obtained from a herd by systematic working, and, therefore, no dairy farmer should be satisfied with less. When that standard is reached, further progress will quickly follow.

The most difficult part of herd testing is to make a start. Those who have not begun are always apt to persuade themselves that it is not necessary in their particular case. The surprise comes when it is found how many cull cows the herd has carried, for any untested herd is a particularly good one in which 10 per cent. of the cows are not so unprofitable that they ought to be replaced with better ones, and there is no time like the present for doing it.

Under the gradual increase in the cost of labour that has taken place during recent years, and which is still going on, the profit from dairy farming under the no-testing method is speedily growing less. On the other hand, where cows are regularly and systematically tested, and calves are as systematically raised from these tested cows mated with milking-pedigree bulls, and culling out of the poorest milkers is continually going on, the milk yield from the herd is gradually on the increase. Consequently, under systematic working, the higher price of

labour does not in the same measure reduce the returns as on those farms where the cows are not tested and properly bred from. *Here, then, lies the solution of the labour difficulty on the dairy farm.* The hours of working cannot be increased, nor can the feeding cost per cow be cut down; but the average production of the herd is possible of substantial increase on every dairy farm by the combined system of testing, culling, and breeding on right lines. Sooner or later this fact must be recognised, and protracted delay means money lost in consequence. In this figurative archway—but particularly in the keystone—lies the effective solution of the labour difficulty on the dairy farm.

FERTILIZERS.

Untold Wealth in the Pacific.

The difficulty of obtaining fertilizers and the high prices ruling for same has caused for some time past much anxiety among agriculturists. Mr. A. Harris, member for Waitemata, referred to the matter the other night, and pointed an exceedingly attractive way out of the difficulty for farmers, and at the same time an opportunity for Australia and New Zealand to profit considerably at the expense of the Hun.

The member explained that midway between the Marshall and Solomon Islands lies Nauru or Pleasant Island, and Ocean Island, two of the most valuable spots on the face of the earth. The islands are of coral formation, and for untold ages have been the rookeries of sea birds, which have deposited guano that has impregnated the limestone, forming phosphate rock 40 feet in depth. The estimated quantity of phosphates is upwards of 500,000,000 tons, and the value of this enormous mass of fertilizer is estimated to rival the famous nitrate fields of Chili. In point of fact, said Mr. Harris, this Nauru and Ocean Island phosphate possesses 85 per cent. manurial value as against 27 per cent. for the best English, and 12 per cent. for New Zealand phosphates—in other words, 1 ton of this island phosphate is equal in manurial value to 3 tons of the best English and 7 tons of the New Zealand product.

Before the war these islands belonged to Germany, and Japanese steamers took away weekly cargoes of the rock to Japan, where it was manufactured into superphosphates, and large quantities were regularly imported by New Zealand freezing companies to mix with their blood manures. The Japanese paid 1 mark (approximately 1s.) per ton royalty to the German Government for the rock, and 1 mark to the native owners.

A few days after war was declared, the Union Jack was hoisted over the island by the British agent at Christmas Island, and Mr. Harris urges that representations should now be made to the Imperial Government for the transfer of these islands to Australia and New Zealand, thus serving the double purpose of helping to keep Germany out of the Pacific and of adding considerably to the wealth of the Commonwealth and Dominion. He points out, moreover, that it would be possible for the New Zealand Government to bring phosphate from Nauru and Ocean Island, manufacture it into the highest quality superphosphate, and sell it to farmers at half the pre-war price.—*Farmers' Union Advocate,* 21/7/17.

APPLE CULTURE IN VICTORIA.

By J. Farrell, Orchard Supervisor.

(Continued from page 588, Vol. XV.)

The Production of New Varieties.

While most of the better varieties of apples cultivated here are importations from other countries, some have had their origin here. These, however, have been produced by chance rather than as the result of careful experiment in self-pollination or the cross-pollination of two varieties.

The aim of our horticulturists should be to win from Nature's inexhaustible store fruit trees endowed with qualities suitable for our soil and climate. The fruit of the early ripening varieties of apples at present cultivated is, on the whole, of a somewhat inferior kind and not of good-keeping quality, and the production of an apple resistant to black spot and bitter pit would bestow an incalculable benefit on our fruit-growers.

The zeal with which breeders of animals endeavour to improve the breed of their flocks and herds is an assurance of national prosperity. Recent experiments in the raising of wheats have led to the production of varieties better suited to Australia than those previously cultivated, and it is obvious that there is a wide field here for experimental work in evolving apple trees that will be characteristically constituted to meet local conditions.

Owing chiefly to the crossing of certain varieties hitherto practised, those now cultivated, although of fixed types and endowed with their individual variety characteristics, are incapable of reproducing, even from their self-fertilized pips, trees with characteristics similar to those of the parents. And the ten pips of any apple, whether cross-fertilized or not, may produce as many new varieties. Speaking generally, however, pips maturing from cross-fertilization should be employed in the evolutionary process, as they are more plentiful and show higher development than those self-fertilized.

When producing a new variety by crossing two of those at present cultivated, and in order that its pedigree may be correctly recorded, it is necessary to carefully remove all the anthers of the floret to be cross-pollinated as soon as its petals open and before the stigmas assume the condition of receptivity, so as to obviate the possibility of self-pollination. Care should also be exercised to prevent the introduction of pollen other than that of the selected variety.

In order to prevent insects coming into contact with the cross-pollinated flowers until their fruits have set, these blossoms should be enclosed in paper bags or gauze, but after this period has passed, however, the covers may be removed and the young fruits allowed to develop under normal conditions.

Labels bearing the name of the variety from which the pollen was taken, or other necessary notes, should be attached to the twigs supporting the cross-pollinated blossoms.

Plate 141 illustrates the method of crossing Rome Beauty with London Pippin, and *vice versâ*. It will be observed, however, that the central

vertical sections of the blossoms with the pistils intact and two stamens on each side are shown, except in the case of those ready to be subjected to cross-pollination and markd (*b*), and here all the stamens have been removed. The Rome Beauty blossom, Fig. 1, (*a*) shows the relative position of the stamens to the pistil, but it appears like (*b*) when all the stamens are cut away. When the anthers of the London Pippin flower, (*c*) burst, and liberate the ripe pollen, they are placed in contact with the receptive stigmas of (*b*). The cross-pollinated flower is then covered, as explained, to prevent its further pollination through the agency of insects, &c. When the young fruit has swelled to the condition of (*d*), the protective covering may be removed. The cross-sections (*e*) and (*f*) were taken from the ovaries of Rome Beauty florets while in the condition of (*b*) and (*d*) respectively. Fig. 2 depicts London

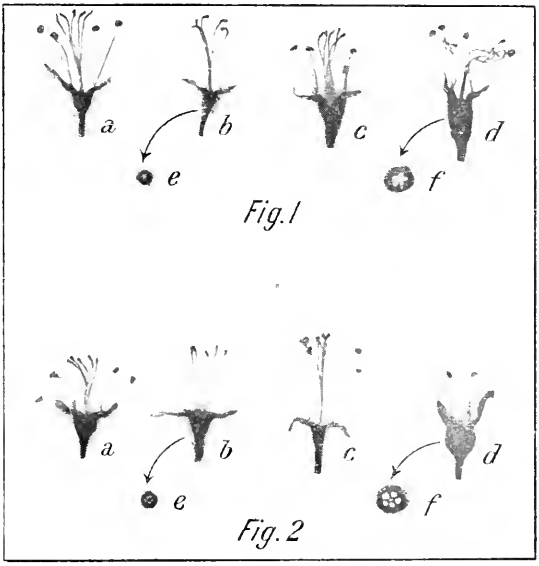


Plate 141.
Fig. 1. Method of crossing Rome Beauty with London Pippin.
Fig. 2. Method of crossing London Pippin with Rome Beauty.

Pippin crossed with Rome Beauty, and the lettering of the specimens in this case may be read in the light of the explanation given in connexion with Fig. 1.

During its development the fruit should be kept free from insect pests and fungus diseases, and when fully matured on the tree it may be removed to ordinary or cool storage, or the pips may be taken from the fruit and kept in a dry cool place until required for sowing. If the pips are sown about the beginning of August in rich sandy loam or other friable soil and covered to a depth of about 2 inches, provided favorable weather conditions ensue, a high percentage of the young seedlings will have attained a height of from 4 to 6 inches by the end of October. During some seasons, in certain localities these growths

continue to develop until they are of sufficient strength to enable them to be used as scions in the following spring.

Plate 142 illustrates the development of the young seedling from the pip. Fig. 1 (*a*) is a Jonathan pip (natural size), (*b*) shows an open capsule with the kernel adhering to one side, and (*c*) is the kernel taken from the open capsule (*d*). Fig. 2 shows elongation of the radix with the seed-lobes still enclosed in the capsule, (*b*) gives further lengthening of the root and shows the seed-lobes having changed in colour from white to dark green in consequence of appearing above the soil and developing chlorophyll. Specimen (*c*) gives higher development of the cotyledons between which the first two seedling leaves appear; while (*d*) shows these in a further advanced stage, and also the second pair of young leaves. It may be noticed that when the seedling

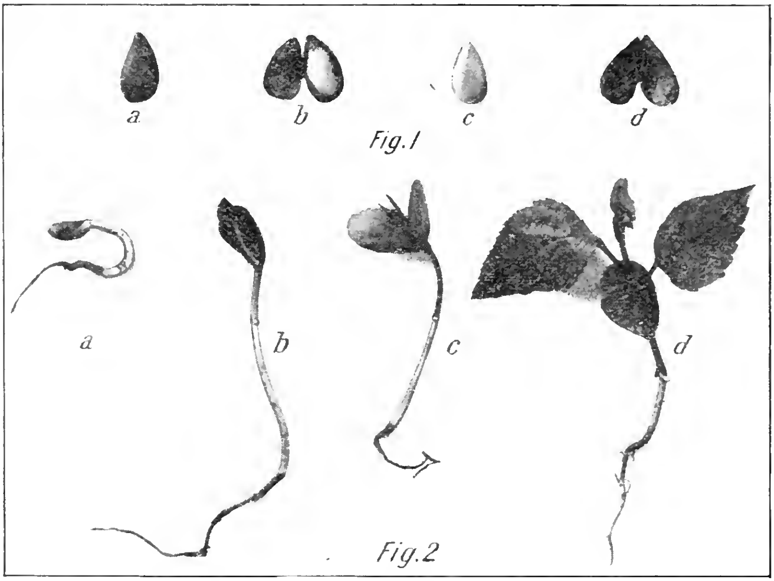


Plate 142.
Fig. 1. Jonathan pips (natural size).
Fig. 2. Development of seedling from seed.

has reached this stage of development lateral root hairs begin to appear along the main root. Usually, until the little root system is established and the first three pairs of seedling leaves are produced, the invigorating materials stored up in the cotyledons supply most of the requirements of the tree.

The pips from which the eight seedlings illustrated in Plate 143 were grown were taken from trees the names of the varieties of which are given below the plate. The seeds were sown on 16th August, and the trees were photographed on 26th November, 1916.

Testing New Varieties.

When new varieties are produced, careful tests with a view to determining their fruiting characteristics, &c., should first be made, and the

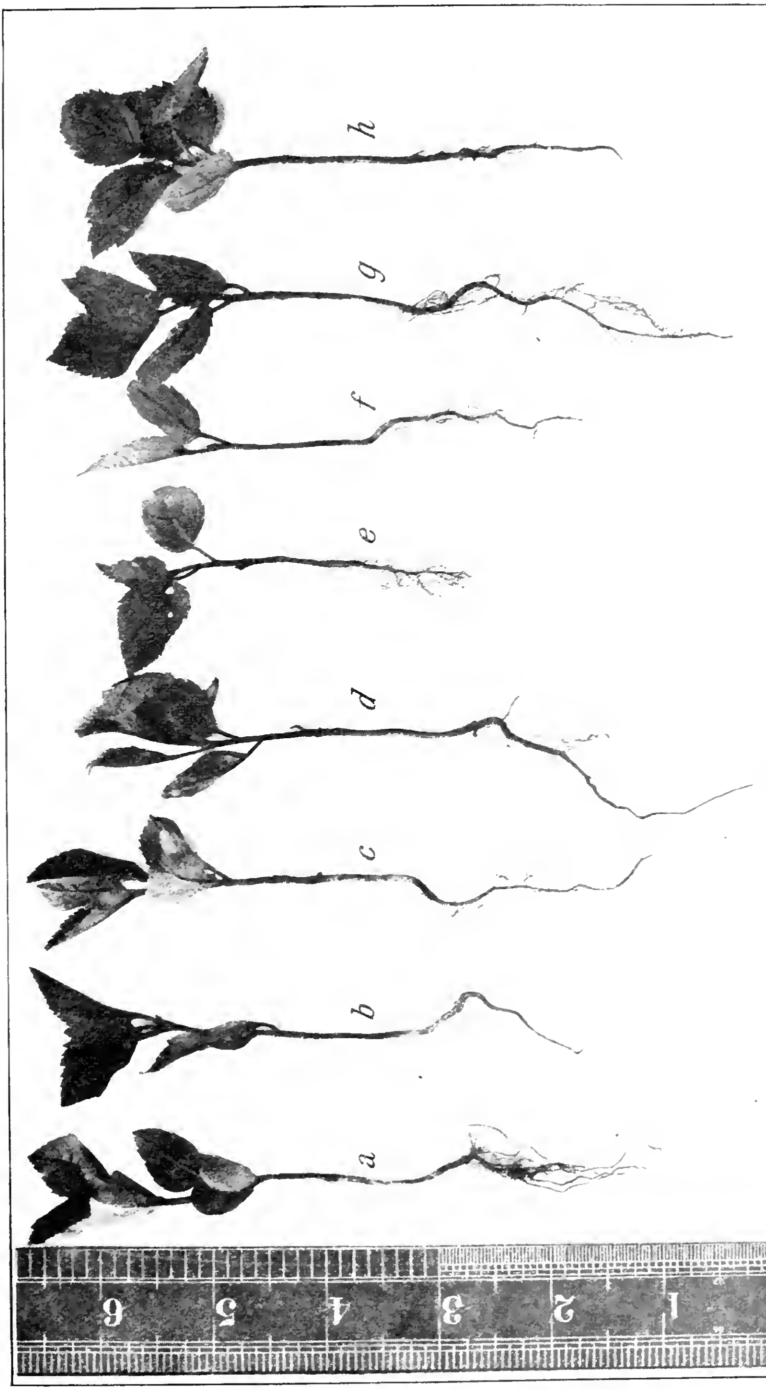


Plate 143.—Seedlings.

a, Jonathan; *b*, Rome Beauty; *c*, London Pippin; *d*, Sturmer Pippin; *e*, Rymer; *f*, Irish Peach; *g*, Northern Spy; *h*, Tasma.

results correctly noted. To make a test of this kind, procure during early spring a portion of seedling wood produced the previous year and graft it on an outer and rather pendulous growth of an established tree. The scion should contain six or eight leaf buds, and the tongue graft should be employed. In this position on the tree the scion, if of fruitful character, will blossom two or three years after the time of grafting. The longer the scion and the more pendulous its stock the sooner the stage of fructification will be reached. When the test proves that a variety is capable of producing only fruit of inferior quality, it may be destroyed, but those yielding apples of good quality should be retained and further experimented with in relation to their adaptability to our many soil and climatic conditions.

When the preliminary, but obviously most essential, test reveals that the fruiting characteristics of a new variety are sufficiently encouraging to warrant the further experiments already mentioned, tests

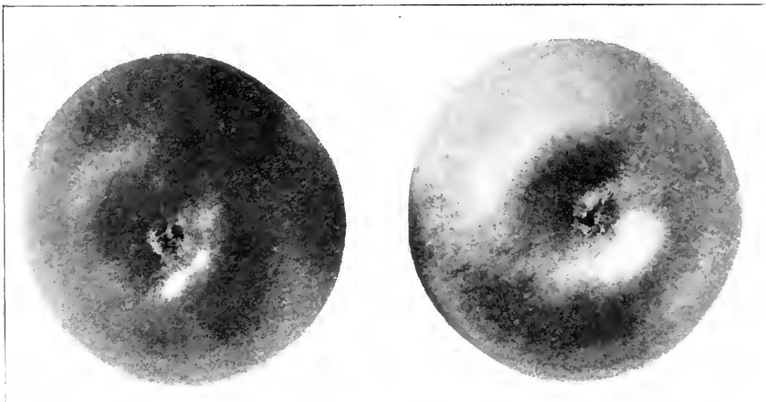


Fig. 1 Fig. 2

Plate 144.

Fig 1. Apple produced on a Statesman sport.
Fig. 2. Apple from the original Statesman wood of the same tree.

should be made to try its adaptability to the conditions obtaining in the various fruit-growing districts of the State. When success attends the latter tests, specimens of the fruit, accompanied by a report containing all the particulars relating to its production, should be forwarded to the Commonwealth Pomological Committee for the consideration of its nomenclators. Should they consider the variety of sufficient merit to bestow on it a name, this would subsequently appear alphabetically listed with the others in the catalogues of enterprising nurserymen. As the variety comes into general cultivation, its habit of growth, pruning requirements, and other particulars should be carefully noted, so that its characteristics in every respect might be, at least, as well understood as those of others at present grown.

Varieties Evolved through Sports.

The wood of varieties evolved through sports usually retains the characteristics of the parent tree, the deviations from the original being

mostly noticeable in the colour of the fruit. Occasionally, however, the size and shape of the fruit are somewhat affected, but the flavour and aroma of the original is usually retained.

It is assumed that one example will suffice to illustrate these statements.

Plate 144, Fig. 1, is a photograph of an unnamed apple produced on the sport of a tree of the Statesman variety growing in Mr. Hy. Chandler's orchard at Bayswater. The apples of this sport are dark red, like highly coloured Rokewood. Fig. 2 is the normal Statesman taken from the same tree. Mr. Chandler, who is a nurseryman as well as an orchardist, is so favorably impressed with the appearance of his red Statesman that he has decided to propagate trees from this sport.

Occasionally trees or portions of trees propagated from sports revert to the original by producing fruit typical of the parent variety. The Glengyle Red may be mentioned as one of those most noticeable for performing in this manner. It is a sport from the Rome Beauty, and the character of the wood and habit of growth of the tree have not altered, but the fruit, instead of being like that of the Rome Beauty, is of a deep, rich, red colour. This is an improvement that warrants the propagation and extensive cultivation of the Glengyle Red, and the reversion of the fruit's colour to that of the Rome Beauty may, at the time of propagating trees of the former variety, be prevented by carefully selecting buds from a tree which produces fruit of fixed type and colour.

The necessity for the evolution of varieities characteristically constituted to meet the various locality conditions, and thus facilitate a higher commercial achievement as well as more satisfactorily meeting the public requirements, is generally realized. These, as well as the other objectives of the industry, may be attained by the further judicious application of science to fruit growing.

The Maintenance of Varieties Capable of Supplying Modern Market Requirements.

In establishing a modern apple orchard the fruit-grower should select a small number of each of the early and late blooming varieties, and thus insure the cross-pollination of their blossoms. Those chosen for planting in any locality should previously have proved their adaptability to its soil and climatic conditions, and the question whether the fruit from these varieties would suit modern market requirements should be considered. Though much information dealing with these essential details has been disseminated by the experts and others interested in apple growing, yet inspection of the districts reveals that obsolete varieties and some of those unsuitable for cultivation under the individual district conditions are still occasionally planted. Although sometimes mistakes of this kind are made through the prospective fruit-growers taking their information exclusively from publications of other countries where the conditions governing apple production are different to ours, very often it is due to the neglect of the orchardist to listen to opinions based on knowledge. Such a person usually selects his trees in haste: they come to maturity in due time, but he repents at leisure. Fortunately, however, instances of this kind are becoming rare.

UTILIZING OBSOLETE SORTS AS STOCKS FOR PROFITABLE VARIETIES.

When the folly of planting undesirable or non-remunerative varieties in a locality becomes apparent, as a result of experience gained by their subsequent cultivation, no time should be lost in substituting suitable and profitable sorts. The best method of attaining this object is by cutting down the trees, and, if the stocks, including the root systems, are sound and healthy, grafting on varieties proved locally to be suitable to the district and profitable. If the stem be short, the crown and

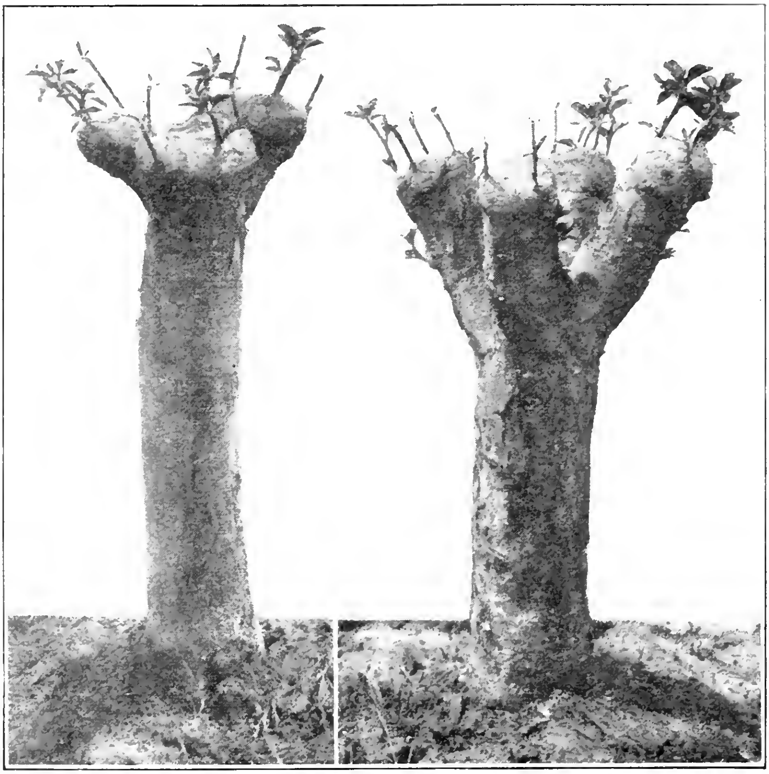


Fig. 1. Fig. 2.

Plate 145.

Fig. 1. Rome Beauty scions on Mr. Gladstone stocks. Commenced with three main arms.

Fig. 2. In this case four main arms were employed.

portions of the leaders radiating from it may be retained and utilized as a foundation for the new superstructure. Formerly the wedge and strap-grafts were used, but during recent times the bark-graft has been most generally employed. This method consists of making a vertical slit, about 2 inches long, downwards from the edge of the sawcut in the bark of the stock with the grafting knife. Then the scion, of yearling wood of the selected variety containing three or four leaf buds, is prepared by tapering it off to a point on one side about 2 inches long. The point of the scion, with the cut next the wood of the stock, is

inserted in the cambium and forced downwards to the full extent of the tapered part, opposite the slit in the bark of the stock. The pressure opens the incision in the bark of the stock and permits of a long union of the cambiums of the stock and scion. When the work is carefully executed, weather conditions being favorable, but few of these grafts fail. A sufficient number of scions, usually from three to six, with which to form the branch system and make a callus sufficiently extensive to cover over the wound before the wood commences to rot and thus prevent its decay, should be employed. When the scions have been placed in position, a piece of strong string firmly tied around the stock

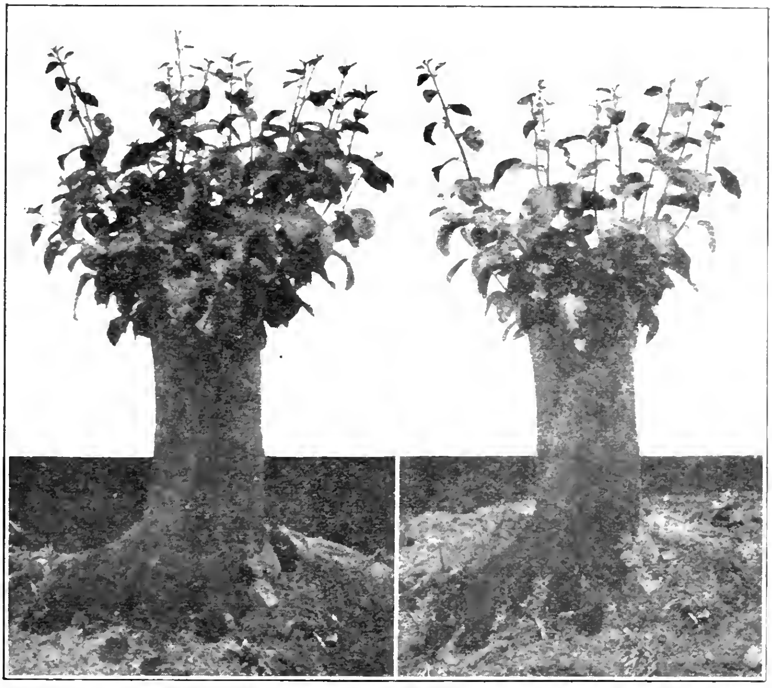


Fig. 1. Fig. 2.

Plate 146.

Fig. 1. Jonathan grafted on to Northern Spy stock.

Fig. 2. Same tree after thinning out of leaders completed.

about 1 inch from the saw cut prevents the further opening of the splits in the old bark. Then a covering of grafting wax or earth excludes the air from the wounded parts until the grafts are firmly established.

The grafting operation should be performed in early spring, when the sap commences to rise in the stocks, and greater success is achieved when the wood required for scions is removed from the trees during winter and heeled in to become partly wilted before being required for use.

In warm districts particularly, the stems should be covered with hessian or other material to protect them from the sun until such time

as the foliage of the scions has sufficiently developed and capable of performing its necessary function.

Plate 145 shows Rome Beauty scions grafted on Mr. Gladstone stocks. Fig. 1 was a tree whose branch system was originally commenced with three main arms, while in the case of Fig. 2 four were employed.

In re-establishing branch systems on trees of the old high stemmed type, instead of retaining portions of the original branch structures, as illustrated in Plate 145, the stems should be cut about 12 to 15 inches above the ground level. When the scions are grafted on these stocks, and subsequently scientifically and regularly pruned, trees of the modern and approved type are substituted for the inferior and badly constructed ones.

Plate 146 depicts a tree being reconstructed as described. The original variety was Northern Spy, and the scions are Jonathan. Fig. 1 shows the scions making strong growth and having arrived at the stage when it is advantageous to remove the weak, superfluous, young leaders, so as to concentrate the growth in the uniform, nicely spaced ones being retained. Fig. 2 is a picture of the same tree and illustrates its condition when the operation of thinning out the leaders was completed.

(To be continued.)

Of the plants growing in New South Wales, over a thousand species have been examined for hydrocyanic acid and cyanogenetic glucosides. Sixty of these gave positive results with sodium picrate paper. These include forty-four species native to New South Wales in seventeen natural orders.

Some plants, well known to be cyanophoric in Europe, when grown in this State have never given any reaction, although tested in all seasons.

Only a few were found to evolve free hydrocyanic acid, naturally, but all showed the presence of a glucoside and enzyme.

When the natural enzymes in these plants were killed by boiling water, the reaction to sodium picrate paper ceased; if then a few drops of emulsin, prepared from sweet almonds, were added, positive reactions were again obtained, showing that in all cases the glucosides present in the plants were capable of being hydrolysed by emulsin.

Of the sixty species stated, twenty are grasses, and these include eleven species indigenous to this State. The *Sorghum vulgare* examined by Dunstan and Henry was found to lose its glucoside when 14 inches high, while the Australian-grown plant retains it when 4 feet high, and mature. Both glucoside and enzyme slowly disappear with air-drying.

One hundred and fifty species of grasses were tested systematically for seasonal variations, and some were found to give negative results at particular seasons. Two species of grasses alone evolved free hydrocyanic acid, and only one of these is available for grazing. This is the only one, except the sorghums, which has been associated with fatalities among stock.

Among the non-cyanogenetic grasses 33 species contained emulsin-like enzymes.

FARMING IN ENGLAND IN EARLY TIMES.

By Professor Walter J. Harte, University College, Exeter.

This article, reprinted from the *Journal of the British Dairy Farmers' Association,* Vol. XXIX., 1915, shows in an interesting way the manner in which our forefathers held their land and cultivated it. That it was satisfactory the history of the times shows, for was not England known as "Merrie England," and did not "every rood of ground maintain its man"? To those of our English pioneers who chance to read this article and come from farming families many of the terms used and explained will, perhaps, be known. To such readers the article should prove instructive. It is also interesting to know how our ancestors lived and worked.—[Editor.]

Those engaged in trying to elucidate what is called History are sometimes expected to show an omniscience which is not demanded of other searchers after Truth; for there is a history of

"shoes and ships and sealing-wax,
of cabbages and kings,"

to mention only a few of the subjects of my all-embracing department. So, when your Committee honoured me with an invitation to read a paper to you, I at once had to disclose some of my limitations, and to confess that I had very little in my stock that was likely to be suitable for this meeting. When my offer of "Farming in England in Early Times" was accepted, I realized that my ideas about the words "farm" and "dairy" were very vague, and, of course, I went to consult Sir James Murray's New English Dictionary. There I found that no satisfactory Teutonic etymology was known for the word "farm," but that it was possibly a late form of the Latin word "firma," which signified a fixed yearly payment, and then a lease, and then a tract of land held on lease for the purpose of cultivation, and from that the name was applied without respect to the nature of the tenure. As for "dairy" it is derived from "dey," which is Middle English for a female servant, and dairy is a place where the function of the dey is performed. Then it means the room or building in which milk and cream are kept and made into butter and cheese, and, lastly, that department of farming concerned with the production of milk, butter, and cheese. This did not give me much assurance that the paper which your Committee had accepted from me would be to the point at a meeting of British Dairy Farmers, for there is not much in it about milk and butter and cheese. However, I was cheered by the thought that under modern conditions the production of one set of commodities involves the subsidiary production of a great many other by-products, and my optimism was strengthened when at the Eastgate I gazed into the windows of that distributing centre with the ecclesiastical name and saw displayed there an array of commodities which certainly did not come from milk; and the sight caused me to hope that my contribution would not be too wide of the mark, unless, indeed, the Cathedral Dairy has a special dispensation or some benefit of clergy which is at present unknown to history.

The Norman conquerors found England divided up into self-supporting villages, which soon came to be known as manors. For the purposes of our story we need not go into the consideration of the

legal and other differences between the Saxon village and the Norman manor, so let us at once try to picture to ourselves what this agricultural unit was like. The system seems to have been the outcome of a very early method of annual re-allotment of arable, which expressed the old sense of kinship, linked with a determination to secure some kind of equality. With its concentration of huts and barns and the close proximity of its arable and pasture, it was a very suitable arrangement for a time when all able-bodied men were liable to be called off for purposes of fighting.

At the head of the village was the lord, with rights and duties pertaining to his holding. He would have his manor house of stone, containing at least a hall, a dormitory and a solar. The dairy would be attached to the manor house. There would also be a grange for storing corn, and probably a garden and an orchard. The ground would be cultivated right up to the doors of the house, for a park or pleasure-ground is a modern development. The church would probably be far larger than was needful for the religious services of the community; but it had many uses besides that of divine service, and in some cases we find it used for storing corn. The village mill would belong to the lord, who would rent it to a miller, and the villagers were compelled to have their corn ground at it. The mud or wooden cottages of the inhabitants would lie along the highway, each with its enclosed croft or close. The arable land lay in open fields, and was worked on what is called the "Two-", or else the "Three-Field" system. Under the latter system the whole of the arable land of the village would be divided into three great fields. On one of these was a crop of wheat, on the second a crop of barley or oats, while the third field lay fallow. Each field was divided into long narrow strips, separated from one another by balks of grass, and the tenants would occupy scattered strips in different parts of these open fields, some holding many separate strips and some only a few. The lord also would have his portion, which he farmed for himself through his bailiff. His was called the "demesne land," and it was sometimes held in strips and sometimes held in severalty. In addition to the three arable fields, there were the meadow for hay, the pasture ground and the waste, and in time an enclosed pasture which was very valuable; and every man who had strips in the arable had a proportionate share of the hay meadow, and certain rights of pasturage, and (unless they were definitely assigned to others) over the waste and over the fallow and gleaned land, for the oxen, horses, or sheep required on the arable for work or manure.

In Tudor times pasture in common was of three kinds: (1) common close, where each man was stinted; (2) tended common where cattle went before the herdsman, and where stints prevailed; (3) the lord's outwoods, where the lord was not stinted but the tenant was. This "shackage," as it was called, is considered by Professor Gonner to be a species of common custom, originating in mutual forbearance as to trespass.

But this is far in advance of the early village economy. However, as time went on enclosed pasturage increased, and we note such names as "Cow Down," "Sheep Down," "Pig Marsh." These divisions mark the growing importance attached to live-stock.

These rights over the land were supplemented by common of estover and common of turbary, the former being the right of taking wood for repairs and for fuel, and the latter the right of cutting peat for fuel.

Professor Gonner distinguishes common "appendant" from common "appurtenant." The former being the right to common on the part of the possessor of a freehold created before the Statute of Quia Emptores. It was limited to pasture for the animals necessary to plough and manure the soil, was proved by mere possession of such an estate, and would be proportioned to the holding. Common "appurtenant" consisted of rights attached by grant or prescription to a freehold or copyhold, including pasture for beasts other than those for ploughing and manure, also estover and turbary, and of this proof might be required. This latter shows that times were changing—new holdings had been erected and a variation of methods of cultivation had arisen, the proportion of arable to stock being no longer constant. Common was no longer regarded merely as a means of maintaining arable land in efficiency, but some part of it existed for immediate profit by pasturage.

At first common right was a necessary complement to the rural economy, then it became a source of special profit, then by some a system of common was valuable as a means of chance gains. In the nineteenth century the idea of a public interest or right appears.

To put it shortly, the holding of arable lands gave a right over some part of the yield of other lands, and generally, too, over the lord's waste. Later the poor came to enjoy minor rights of common, and turned out pigs and geese, gathered fuel, and even pastured a cow, but these privileges began on sufferance and were really a trespass.

On some manors the lord exercised the right of feeding sheep over the lands of the tenants during certain seasons of the year, and even of having the tenants' sheep folded on the demesne fields for the sake of the manure. Then in time we find the granting of rights over land attached to a house or cottage without arable land; and the next step will be a grant to men who hold no land on the manor, though these might be restricted during hay-time.

In copyholds we find the right of pasturing beasts other than those used for agriculture, namely, sheep, swine, goats, and geese, in proportion to the holding and the capacity of the area, unless a definite number is mentioned in the document.

This open field system was usual all over the greater part of England 150 years ago, and there are a few survivals even at the present time. Sir J. B. Phear, in the "Transactions of the Devonshire Association" for the year 1889, describes such a field at Braunton. There is found what is called "The Great Field," consisting of about 350 acres of level ground made up of small unenclosed plots. There are some sixteen parcels, each divided into strips separated by a balk. Each parcel is marked off by a stone sunk in the ground at the corners. Most of the holdings are small, there being 491 strips to about fifty-six owners. Apparently here all the villeins had freed themselves, for their successors are emancipated from all the original "servitudes" and are freeholders.

Walter of Henley, a farmer and perhaps a bailiff on an estate belonging to Canterbury Cathedral, who wrote in the thirteenth century, shows clearly that the farming at this time was "subsistence" farming, and only the surplus crops were sold at the local markets or at the annual fairs, after the wants of the village including part payment of labour, had been satisfied.

Besides the demesne land, there were sometimes estates of freeholders who paid quit-rents to the lord. But most of the land would

be held by villeins, bordars, and cottiers, who held by fixed and commutable services. The normal holding of a villein was a virgate, or yardland, of 30 acres, whilst the cottier would have only a cottage and a garden and at the most 5 acres.

The following extract, which is a translation from the "Exeter Domesday," gives one an idea of the village of Braunton to which I have already referred: "The King has a manor called Braunton which King Edward himself held and it was answerable for one hide. This can be ploughed by forty ploughs. Of it the King has one carucate of land and one plough, and the villeins have thirty ploughs. There the King has forty villeins and thirty bordars and four serfs and 100 sheep and 40 acres of coppice and 2 acres of meadow and 40 acres of pasture, and it returns yearly 16 pounds by weight.

"Algar the priest has one hide of land in Braunton which he holds in alms of the King. This can be ploughed by eight ploughs. Of it the priest has one virgate and three ploughs in demesne and the villeins have three virgates and five ploughs. There the priest has three villeins and twenty-three bordars and five head of cattle and twelve swine and 100 sheep and ten goats and 20 acres of pasture, and it is worth 50s."

The work of the village was done by the co-operation of all the inhabitants, and we must remember that practically all men were landholders. There was community in cultivation but not in ownership.

The demesne was cultivated by dependents wholly maintained by the lord and by the part-time services of the villeins, each of which would have work somewhat as follows: He would have to plough in the spring 4 acres, and to supply two oxen for the plough-team three days in winter, and three in spring, and one in summer. Each would work for his lord three days a week, and perhaps pay a yearly toll of money, say 2s., a hen and a score of eggs. Each cottier would work one day a week. The following quotation gives us the duties of one Hugh, son of Chrispian, at Haghe, who held a messuage and a quarterium of land. He was to pay 1s. a year in rent, to carry dung at a ½d. a day, or to give 1½d. instead. He was to plough and to be fed or to pay 6d. for the year's work. He was to gather nuts for three days or to forfeit 1½d. He was to supply one man in harvest or pay 2s., to plough half an acre for winter and another half for Lent corn or pay 7d. He was to shear sheep and lamps or pay ½d. a day, to hoe and be fed or forfeit ¾d. a day. To collect stubble for three days before dinner and receive a ½d. or forfeit 1½d. To give a hen of the value of 2d. and a cock worth 1½d., and find a help for the thatcher or forfeit ¾d. These services would in process of time be commuted for a money payment. The terms would be written down and a copy kept by the tenant, who would then become a copyholder.

The cattle, sheep and swine would be looked after by village officials, the herdsman receiving about 2d. a quarter for each beast, and the swineherd 1d.

A writer in the sixteenth century called Fitzherbert gives what he considers to be the duties of a wife in the life of the manor—"It is a wyves occupation to wynowe all maner of cornes, to make malte, to washe and wrynge, to make heye, shere corne and in time of nede to helpe her husbande to fyll the mucke wayne or doune cart, dryve the plough, to loode heye, corne, and such other, and to go or ride to

the market to sell butter, chese, mylke, egges, chekyns, capons, hennes, pygges, gese and all maner of cornes."

For hay-making additional labour was often obtained from a distance if possible. The means of supporting winter stock depended upon the supply of hay, so the bailiff, after calculating his resources, killed down for salting, about St. Martin's Day (11th November), as many sheep, oxen and calves as exceeded his means of sustenance.

It is obvious that this system of farming involved an intricate mesh of mutual privileges and obligations, and it must have required a very tactful bailiff to get anything like a moderate amount of work out of the parties concerned, because we must remember that tenants could not be dismissed as can the modern labourer, and besides it would have been impossible to find others to fill up the vacant places even if it were desirable to do so.

The small freeholder on a manor, where such existed, was really better off than the lord, as the former was liable to no wardship and could dispose of his property as he desired, whereas the lord was responsible to his overlord for all feudal dues. The wealth of the lord was derived less from the profit of the demesne land than from the fines, quit rents, compositions, tolls on fairs, markets and ferries, profits from manor courts, and similar incomings, which though trivial individually amounted in the aggregate to a considerable sum.

One naturally asks how it was that a system which from our point of view was so very inconvenient prevailed for such a lengthy period. The answer seems to be that when once in working order the method formed a complex system hard to alter, especially as the art of land-surveying was unknown; that custom, which is difficult to break even at the present time, was in olden times an impassable barrier to experiment and progress; that it insured an equitable distribution as far as the quality of the land was concerned; that it showed up any very bad husbandry or extreme negligence, and, if it did not facilitate the improvement of the land, it at any rate kept it from becoming worse.

Before proceeding I must draw your attention to the two-field system at work on some estates. In one of these fields there would be a crop growing, and in the other there would be three ploughings in the course of the year. We find an interesting modification of this method when each field was divided into half fields and then each was "cropped" every alternate year, but the half which bore wheat one year would be sown with barley next time it was "cropped." Thus a four-field system was introduced, and this was very easily changed into four-course husbandry in the eighteenth century with the introduction of turnips, making a rotation of wheat, turnips, barley and clover, and thus avoiding the necessity of keeping one field fallow, as in the old system.

And now before we go on to describe the changes brought about by the Black Death in the reign of Edward III., let me give you a few details about what was produced on the manor, and the expenses entailed in cultivating it.

In 1340 beef or mutton cost about $\frac{1}{4}$d. a lb.* In London in 1533 beef cost $\frac{1}{2}$d. and mutton $\frac{3}{4}$d. a lb.† But the meat must have been stringy and tough, and diseased meat was cooked and eaten. Walter of Henley writes (about 1270): "If one of your sheep dies, put the flesh at once into water and keep it there from

* Multiply by twelve to get the approximate value now.
† Multiply by four to get the approximate value now.

daybreak till nones (3 p.m.), then hang it up to drain thoroughly, salt it and dry it; it will do for your labourers." And Tusser in the sixteenth century recommends that diseased pigs should be slain, salted, packed, and the pork sold to the Flemings.

Even as late as 1547, the average weight of oxen purchased for the Navy was less than 400 lbs. English sheep suffered from scab before the end of the thirteenth century, and the affected parts were treated with tar mixed with butter or lard.

The most important animal in mediæval economy was the pig. These animals fed in fields after harvest and in woods. We read of them also in the towns. Thus Stow in his "Survey of London" says that they fed on the dung hills, and in the Act Books of the Exeter City Chamber I have found frequent notices of men who were brought before the Justices for keeping pigs in the City contrary to regulation.

The returns to agriculture were very low in these days of subsistence farming, and it is very difficult to form any sure estimate as to comparative values, for the prices quoted only represent the surplus on the estate sold after the requirements of the inhabitants had been satisfied, the first care being to make the manor as self-supporting as possible. Besides, the imperfect means of communication caused great variations in price, the cost of carrying corn by cart with two horses and a man about 1340 being estimated at 1d. a ton per mile. But this would vary very much according to the time of the year and the demand for horse work on the farm.

Wheat was the customary food of the people, though barley was sometimes mixed with wheat in allowances to farm servants. Wheat was sometimes malted, but barley was chiefly used for beer, and oat malt common. However, the chief use of oats was for horse food, although oatmeal was used for the broth or porridge.

Walter of Henley advises that 2 bushels of wheat should be sown to every acre. This seems to have been done by the bailiff himself. A return of between 6 to 8 bushels was considered satisfactory, after the land had received three ploughings, at a cost of 6d. an acre, and harrowing at the cost of 1d. Ploughing was done by oxen yoked in a team of eight, although we find horses used in some places. But oxen were more satisfactory, because after they were past work they could be used for food. It is estimated that each person would require one quarter of wheat for his sustenance during the year, which would mean that there must have been as many acres under cultivation as there were inhabitants. Professor Thorold Rogers estimates that the population in 1340 was between 1,500,000 and 2,500,000. This would mean that between 4,500,000 and 7,500,000 acres were under cultivation. We must remember that a great majority of the inhabitants, even of the towns, were engaged in agriculture, and the long vacation still enjoyed by the Law Courts and the universities is said to have been due to the fact that all were required in the harvest fields between the months of June and October.

The corn appears to have been cut high on the stalk, and the stubble was mown after the crop was gathered. A method of threshing corn is mentioned in Marshall as peculiar to the West of England, the ears being beaten on a cask, so that the straw which was required for thatching should not get bruised. Fitzherbert, in 1523, says: "In Somerset they do shere theyr wheate very lowe; and the wheate strawe that they purpose to make thacke of they do not threshe it but cut

off the ears and bynd it in sheves and call it rede." Matthew Paris gives the price of wheat in 1244 as being 2s. a quarter.

Iron was a most serious item among the commodities which the bailiff had to buy. Some came from Sussex, the most important iron district in England until the "Industrial Revolution" of the eighteenth century, and some came from Spain. The practice at first was for the bailiff to buy the raw material in bars at one of the great fairs and employ the village smith to make it up. But this plan was abandoned after the Black Death, and the bailiff bought the article itself from the smith, a procedure which points to the fact that the economic position of the latter must have been much advanced. The price of iron before the plague was about 4s. a "hundred," and after that calamity it reached an average of 9s. 6d. In 1500 the price of wrought iron averaged between £5 and £8 a ton, but by 1570 it was about double that amount.

Horseshoes for riding horses must have been very thin and poor. In the fifteenth century they were about 2s. a dozen for fore shoes and 1s. 6d. for hind, but by the end of the sixteenth century they had risen to between 3s. and 4s. a dozen for each kind. Those used in husbandry were far cheaper, being about 8d. a dozen.

The great expense of iron explains the fact that cart wheels were frequently made solid, cut from the section of a full-grown tree. Wooden ploughs and harrows with wooden pegs were used, and so the land was scratched rather than ploughed. The share of the plough must have been a very slight affair, having a wooden frame with an iron point to it. Steel was employed for the tips of the cutting edges of iron tools and was four times as dear as iron. Canvas had to be bought for mill sails and bags, and millstones were a heavy item in a bailiff's accounts. In 1331 the bailiff of Cuxham purchased five in London at the cost of £15 16s. 8d., and there were further expenses incurred in getting them carried to Henley by water, and thence on carts to Cuxham. The best stones came from the neighbourhood of Paris and from Andernach on the Rhine.

Candles and suet were sometimes dearer than butter, and all fats were dearer than meat, for a cow might be made to yield milk and so provide butter in winter, but the farmer could not give animals the means of putting on flesh—still less fat! So while meat was about ¼d. a lb. fat cost about 1½d. or 2d. Candles averaged 2d. a lb. They were therefore a rare luxury, and used on the farm only at lambing time. Rushes soaked in grease were the ordinary substitute for lighting purposes. The wick of the best candles was made of cotton which came from Sicily and Italy. Suet was used for candles and also for lubricating cart wheels and mill machinery, and for dubbing leather.

Cows were, of course, kept for butter, cheese and milk, but the milking of ewes was also a common practice in mediæval times, and Walter of Henley estimated that ten ewes were as productive in milk as one cow. Fitzherbert says: "In the poore of the peeke (high) countreye and such other places where as they use to mylke theyr ewes they used to wayne theyr lambs at twelve weekes old and to mylke theyr ewes five or syxe weekes." Milk was sold almost always at 1d. a gallon.

Cheese and butter were produced on almost all estates, the latter being made all through the year, and it was often melted. It was used for sheep-dressing and cart grease as well as for food.

The manufacture of cheese commenced at Christmas and continued till Michaelmas. The price probably averaged about 1½d. a lb. Two cows would produce a wey* of cheese during the season, besides half a gallon of butter each week if the pasture was good.† From this it appears that some of the cheese was made of skimmed milk. Rennet was used, and the curd was put into a vat and pressed through cloths.

The custom grew up of letting out the produce of the cows and ewes at annual rents, the cows at about 6s. a year and the ewes at 1s., the "deye" taking the risk and the owner supplying the food. The reason suggested for this plan is that it was almost impossible for the bailiff to check the management of dairy.

It is surprising to learn how very small was the amount of wool which the mediæval sheep provided. The average weight of a fleece at Stockton, in Sussex, in 1267, was 1 lb. 1 oz., and the weight was seldom more than 2 lbs. The quality also was coarse and the fibre full of hairs. As to the price, Professor Rogers estimates that the average between the years 1260 and 1400 was just over 2s. the clove of 7 lbs. The same authority notes a great variation in the prices of different districts in 1454; for at Leominster a stack of 364 lbs. fetched £13, and in Sussex only £2 10s. But wool does not, as a rule, appear in the bailiff's accounts, as its sale was effected by a special officer. After the shearing it was put up in canvas packs and sometimes stored in the church.

Eggs, poultry, and also pigeons, were exceedingly abundant. Honey did not fetch a high price. Professor Rogers thinks that bees were not commonly kept, but it looks rather as if bee-keeping was universal, and that there was, therefore, no market for honey. It was certainly much used instead of sugar and also in the manufacture of mead. The same authority thinks that rabbits were introduced into England about the year 1200. As they seldom wander more than 100 yards from their homes they would spread very slowly. They were quite dear in 1270, the price being 5d. each.

There were very few vegetables; onions, leeks, mustard, peas, and possibly cabbages and nettles, were grown in the gardens; apples and sometimes pears, in the orchards. Ale, made without hops, and cider were drunk in great quantities. Wine also was made in England, but not as generally as some suppose, the word *vivarium*‡ being mistaken in manuscripts for *vinarium*.||

The constant recurrence of the name "Fish-ponds" throughout the country reminds us that whenever it was possible our forefathers insured a constant supply of fish in their immediate neighbourhood. It was a dear commodity, but a very important article of diet, as it was the only animal food that the Church permitted during its fasts. It was also in great demand during the winter, to relieve the monotonous round of salt meats which our ancestors had to endure; but they did not restrict themselves in their choice as much as we do, for we find whale and porpoise, conger and eel all considered choice dishes.

The Black Death was certainly the most terrible epidemic in mediæval times. It reached the coast of Dorset in August, 1348, and rapidly spread over England. It was a time when the science of statistics was unknown, and consequently we get the most

* 196 lbs. † Walter de Henley.
‡ Fishpond or warren. || Vineyard.

exaggerated reports as to the mortality of the time, but it seems reasonable to conclude that nearly one-half of the labourers in England perished. This disaster jerked men out of the old ruts and necessitated changes in the conditions of tenure and occupation, whilst it finally resulted in the completion of the commutation of services into money rents which had been going on slowly for some time. In many places the calamity was so terrible that there were none left to till the land or tend the flocks. Tenants died off and land went "a-begging." This was a serious state of affairs for the lord and threatened him with ruin. For the only time in English history the landlords competed for the services of labour, and wages rose enormously in spite of the attempts made by Parliament to keep them down, and the price of all commodities to which labour added the chief value was often more than doubled. The attempts of the lords to compel men to go back to weekly labour failed, and it was necessary to plan a new system, or rather make use generally of a system which had been already evolved in some districts. This was what is called the "stock and land lease," in which the lord leased the land and provided the stock upon it. It did not, however, continue for more than fifty years, presumably because tenant farmers became opulent and were able to purchase their holdings. Then there was the ordinary lease which became the usual method, although before the Black Death it was most uncommon, except on some estates owned by the Church or by other corporations. In many other cases after 1348 the lords were only too willing to alienate small parcels of the land. Grants of demesne were made at new quit rents, and free-farm rents became general. These fixed rents at first seemed high, but agriculture improved, and they were easily borne.

Professor Rogers illustrates the state of affairs from extracts taken from the accounts of Merton College, Oxford. This corporation held lands situated in a great many counties, north, south, east and west, and even before the plague some of its lands were held on lease. After the plague all its lands, except those near Oxford, were let* with the stock, and the rents were payable in money and corn.

Only in the Eastern Counties did the great land-owners continue to practise agriculture on their own account.

But the most noticeable policy pursued at this time was the conversion of arable land into enclosed sheep walks. It was impossible to obtain labour to continue the old routine, and there was a great demand on the Continent for English wool. The enclosures then of the fourteenth century did not displace labour, but were necessitated by a dearth of that commodity, and with them capitalist farming may be said to begin. There was wool for sale instead of merely subsistence farming, and farming became a business which was expected to yield a return from the prices fetched in the market.

Moreover, by the end of the fifteenth century convertible husbandry had been introduced in some districts. This involved the breaking up of the permanent fields and the formation of six separate closes. Three were set aside for corn, with the rotation of wheat, barley and fallow, a fourth was for the pasturage of cows, a fifth for sheep, and the last was retained for meadow. This enclosure for tillage and grazing combined was a benefit to the community; more

* Basingstoke for twenty-one years.

corn and food were produced, and the demand for labour in hedging and ditching increased.

It was not until Tudor times that we heard general complaints that enclosure involved depopulation. The dissolution of the monasteries threw almost one-third of the land of this country into the hands of "new" men, and they were determined to work their new estates for a profit. The most lucrative kind of farming at the time was sheep-breeding. The result was a cry through the land that "sheep were the devourers of men." The distress caused by the conversions of arable to pasture reached its height in the reign of Edward VI., but the trouble did not end until, with the growing prosperity enjoyed during the reign of his sister Elizabeth, the population increased, and it paid to grow corn, and was no longer good management to graze only and not to till.

Capitalist sheep-farming led to the rise of a new phenomenon, namely, competitive rents. Mediæval rents were, as we see, practically fixed; they were quit rents, and corresponded to the value of the labour services of which the lord was deprived by commutation. But rent under the new conditions became a payment for the use of the soil, and the landlord came to expect a sum that represented the value of the land when used in the most remunerative way.

Although the greater part of English arable land was worked on the open field system until the middle of the eighteenth century, there were districts where the method had been abandoned long before, and some which were probably taken into enclosed cultivation from the start. Salop, Herefordshire, Worcestershire, Somerset, Devon, Wiltshire, Berkshire, Hertfordshire, Essex, Kent, Surrey, and Sussex had all been enclosed before the seventeenth century, and the same is probably true of Cornwall. Indications of very early enclosure are to be found in the very irregular form of fields, also in the smallness of their area, and in the thickness of the hedges and the high banks which surround them. Enclosed fields are to be expected in the districts which were occupied by the Saxon invaders in the later periods of their conquest; where the area was enlarged and cleared of forest, or drained after the original settlement had taken place; and also where new demands arose from the arrangements for providing for the wants of the adjacent town, and the town, moreover, would tend to draw off people from the country-side, and those left would be driven to pasturage, because that made the least call on their reduced numbers. Nor must we forget that the proximity of a flourishing town was subversive to custom and encouraged men to farm for profit instead of for mere subsistence. We hear that Devonshire was so full of cloth-making by the middle of the seventeenth century that food and wool had to be imported to supply the needs of the inhabitants. Next we must notice that hilly, forest or moorland would soon prove unsuitable for an arable system. Further the demand for wool would encourage the formation of enclosures, the advantages of which were obvious as far as pasturage was concerned. Then new land turned out of the wild and held in severalty would show up all the disadvantages of the open field system and cry out for a change.

There is no documentary evidence of these early enclosures, for where tenants had no rights, or had ceased to have rights, the process would go on without leaving any evidence as to date, for there would

be no protests, and no legal transactions. However, there is the Statute of Merton of 1236 to show that enclosure was proceeding even at that early time, for it grants to the lord the right of "approvement"* of as much land as he liked, provided that his action did not interfere with the legitimate claims of the tenants.

The counties bordering on Wales are said to have been affected by the condition of agriculture in that Principality where coaration did not exist. Professor Gonner, whose book on "Common Fields and Enclosure" is indispensable for the student of this subject, observes that where this was absent common right over arable after harvest would also vanish, and one of the difficulties of enclosing would be removed.

Marshall, writing in 1805, found that there were no common fields in West Devonshire. He saw that there the cultivated lands were all enclosed, having the appearance of having been formed from a state of common pasture, in which state some considerable part of the district remains. The better parts of these open commons evidently had formerly been in a state of aration, lying in obvious ridges and furrows and generally with the remains of hedgerows.—He suggests that this condition had arisen from the custom of the lord of the manor having the privilege of letting portions of common land to tenants for them to take one or more crops of corn, and after that it was allowed to revert to grass. Thus the lord would get the wild land tamed and would keep it in grass.

Enclosure of land for sheep-farming certainly took place in the fifteenth century, but probably it was rather the enclosure of common and waste than of arable. Also frequently demesne land was converted into pasturage. Enclosure for pasture was not always for wool, but for food when the district was near a growing town population.

Between 1550 and 1700 we get the enclosure of a great quantity of land hitherto wholly wild or in scant use in Cornwall.

The enclosures of this period are connected with the growth of farming, the new land brought into cultivation being largely arable; and this is especially true of the newly-drained areas. It is at this time also we notice the growing importance of the dairy, and the Gloucestershire Vales, West and North-East Wiltshire, with the Cricklade and Aylesbury districts, are all given by Professor Gonner as being enclosed by the end of this period. In Surrey, Sussex, and Kent the enclosures were probably made from the wild at an early date, but not for arable purposes. Much of the arable, though remaining "open," was held in severalty, and was not subject to common rights of pasture. The "enclosed" condition of Kent was fully recognised in Burton's Anatomy (1621). Norfolk, Suffolk, and Essex also appear to have passed through their stages of enclosure at a very early date. In Somerset there were very large enclosures from the wild in early times, and also enclosures of open fields, especially around Taunton, and in the north-east. There was enclosure of demesne and possibly of common fields in the sixteenth century, and also probably of land from wild, and we may say that practically the bulk of this county was enclosed by 1700.

Great interest was shown in farming in the seventeenth century. Whilst in the sixteenth we have only two writers of any importance,

* Enclosure.

Fitzherbert and Tusser, in the next century there were many more, including Markham, Weston, Plattes and Taylor. Englishmen were interested in Flemish and Brabant methods of cultivation. It was at this time that the Cambridgeshire fens were drained, and also Hatfield Chase, near Doncaster, whilst the salt marshes of Essex and the low lands of Norfolk were banked against the sea, thus providing a largely extended area of good pasturage.

On the whole it would seem that, in spite of the Civil Wars, English farming industry throve in the seventeeth century, and we find that the rents of both arable and pasture rose decidedly, though Professor Rogers attributes the rise to the demand made for land by those who had prospered by the growth of trade.

There is only one more development to be mentioned, and that is the introduction of turnips into the regular rotation of crops by Lord Townshend about the year 1730.

And now I must bring my remarks to a close, with the hope that I have not taken you with me so far into the past that you will be unable to return to the consideration of those modern conditions which are so essential to the successful prosecution of the art of dairy farming in modern times.

LUCERNE GROWING IN SOUTH GIPPSLAND.

By A. Mess, Dairy Supervisor.

Lucerne when properly treated ranks among the most valuable of all fodder crops. Certain climatic conditions, suitable soil, and ample moisture are necessary for its success, and when these are present it stands without an equal for rapid growth and prolific yields per acre.

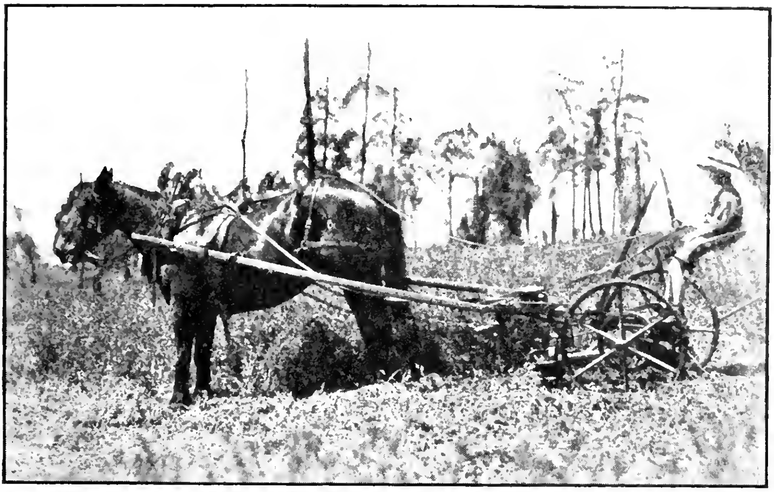
That lucerne can be grown in the hill country of South Gippsland without irrigation has been profitably proved by Mr. J. F. Tuckey, of Carrajung. Mr. Tuckey's farm is situated 1,000 feet above the sea level in hilly country, which is really a continuation of the Blackwarry Ranges. The soil is rich dark chocolate with a semi-porous subsoil. Ten acres have been sown down with lucerne—four with Hunter River seed in April, 1913, and six with French Province in November, 1914—and now over the whole paddock there is a splendid growth, which flourishes through the hot summer months, when all other pastures have withered.

An easterly slope was selected for sowing. After ploughing about 8 inches deep, the land was reduced to a fine state of mellowness and tilth for the reception of the seed, which was sown broadcast (18 lbs. per acre), with a dressing of 1 cwt. of superphosphate to the acre.

During last year the lucerne was cut four times—in September, about the end of October, in the middle of December, and for a fourth time towards the end of January. The first two cuttings were of an average height of 3 feet; the other two were not quite so good. The first two cuttings were not required for feeding, as there was an abundant growth of grass at the time, and therefore it was made into silage, which subsequently proved to be of excellent quality. A common idea with many landholders is that, no matter what kind of fodder is put into a silo—thistles or grass of any description—good ensilage is bound to be the

result. A little reflection will, however, I think, convince most that the better the material put into the silo the better will be the quality of the ensilage.

The third and fourth cuttings were fed direct to the cows, fifty-five being kept all through the dry months. A certain quantity was cut



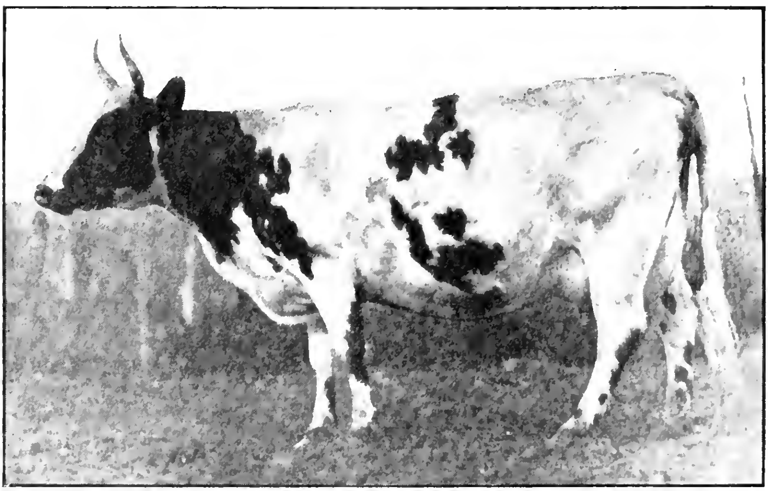
Second cutting—October, 1916.

Third cutting—six weeks' growth.

every day with a mowing machine, and, after being allowed to wilt in the sun, was carted to the paddocks on a sledge, and fed to the cattle. A few acres of lucerne means an abundant supply of green succulent fodder through the summer months—one of the great essentials for keeping up the milk supply. Dairying occupies the chief attention of the

bulk of the landholders in South Gippsland, and its permanence will depend to a great extent upon the provision of sufficient quantities of artificial fodder for the dairy herds. There is no other fodder plant that will, at the same cost, and from the same area of land, produce as much fodder per acre as lucerne. Wherever soil and climate favour the

Good type "machines" for converting lucerne into milk.



One of the "machines"—a profitable investment.

cultivation of lucerne, every dairyman would do well to follow the example of Mr. Tuckey, and set apart for it a certain area of his holding. If irrigation can be applied, so much the better; when well established and thoroughly irrigated it will yield from six to eight cuttings during the season, and for stock-owners lucerne may justly be termed the "Chieftain of the Fodder Plants."

LIST OF FERTILIZERS REGISTERED UNDER THE ARTIFICIAL FERTILIZERS ACT FOR THE YEAR 1918.

P. Rankin Scott, Chemist for Agriculture.

Under the provisions of the Artificial Fertilizers Act, all manufacturers and importers of fertilizers are bound to submit for registration on or before the 1st November in each year, a brand for each fertilizer they intend offering for sale during the following year. In addition to his full name and place of business, and the figure, trade mark or sign to be associated with a fertilizer to identify it, each applicant is required to give a statement of the percentage composition of the fertilizer for which registration is desired in respect of its nitrogen, phosphoric acid, and potash, showing the forms in which they occur, and the retail price of the fertilizer. The list of registered brands that have been accepted is to be found on pages 42 to 46 of this issue.

The term "form" has reference to the combination of the fertilizing constituent with other constituents. On the combination of the essential element with other elements largely depends the availability of the fertilizer.

A fertilizer according to the Act is any material containing nitrogen, phosphoric acid or potash which has been manufactured, produced, or prepared in any manner for the purpose of fertilizing the soil or supplying nutriment to the plant. The brands registered include only nitrogen and phosphoric acid.

Unit Values.

In order to arrive at the unit-values for the year, the Chemist of the Department of Agriculture, from the result of the analysis of fertilizers set forth in the applications for the annual registration of brands, and taking into account the constituents which have a commercial value, and the value thereof, in the simple fertilizers in which they occur, calculates the average unit-values of such constituents. Such average unit-values form the basis for calculating the values of all fertilizers for the period during which any registered brand continues in force. A table showing the different unit-values fixed for the year 1918 is shown on page 41.

These values serve a useful purpose, as they enable a purchaser to compare the value of various brands. To determine the value, multiply the percentage of the constituent as guaranteed by the unit-value fixed for the same, according to the form in which it occurs, and the result will return the value for that ingredient. When a fertilizer contains more than one ingredient, this method of calculation must be repeated, and the several results totalled in order to ascertain the value of the fertilizer.

Take, for example, a bone fertilizer and a bonedust—

Bone fertilizer containing—

	Per cent.		Unit-Value.	Value per ton.
Nitrogen	4.75	×	14s. 0d.	£3 6 6
Phosphoric acid—				
Citrate, soluble ..	8.25	×	5s. 0d.	£2 1 3
Citrate, insoluble ..	6.75	×	3s. 6d.	£1 3 7
Total	15.00			£6 11 4

Bonedust containing—

Nitrogen	.. ..	4.00 per cent.
Phosphoric acid	.. ..	18.00 per cent.
Mechanical condition—		
Fine bone	.. ..	33.00 per cent.
Coarse bone	.. ..	67.00 per cent.

Nitrogen in Fine Bone .. .. $\frac{4.00 \times 33}{100} = 1.32$ per cent.

Nitrogen in Coarse Bone .. .. $\frac{4.00 \times 67}{100} = 2.68$ per cent.

Phosphoric Acid in Fine Bone .. $\frac{18.00 \times 33}{100} = 5.94$ per cent.

Phosphoric Acid in Coarse Bone .. $\frac{18.00 \times 67}{100} = 12.06$ per cent.

	Per cent.		Unit-Value.	Value per ton.
Nitrogen, fine bone ..	1.32	×	16s. 0s.	£1 1 2
Nitrogen, coarse bone ..	2.68	×	14s. 0s.	£1 17 6
Phosphoric acid, fine bone ..	5.94	×	5s. 0d.	£1 9 8
Phosphoric acid, coarse bone	12.06	×	3s. 6d.	£2 2 3
Total				£6 10 7

Besides the slight variation in the method of calculating the value per ton of these fertilizers, the foregoing illustration is intended to draw attention more directly to the difference in the form of guarantee required for these fertilizers.

Bonedust is a fertilizer made from crushed or ground bones, and its value depends largely on (*a*) the percentage of nitrogen and phosphoric acid it contains; (*b*) the degree of fineness of the particles of bone.

Bone fertilizers differ from bonedusts in that they contain other materials, such as gypsum, marl, superphosphate, and rock phosphate. The latter material is added on account of its high phosphoric acid content. The addition of rock phosphate does not tend to make the fertilizer as available as one made wholly from bone. Therefore, no brand is registered as a bonedust which contains any of the materials mentioned.

Basic Phosphate.

This fertilizer is of recent introduction, and owes its appearance on the list of published brands to the shortage of supply of Thomas Phosphate. It is prepared locally by mixing superphosphate with sufficient lime to neutralize all the free acid, and convert the superphosphate into a less soluble form. Superphosphate so treated contains its phosphoric acid mainly as citrate soluble, and thus bears some resemblance to Thomas Phosphate, but differs therefrom, however, in the degree of fineness of its particles, being much coarser grained. The finer the particles composing a fertilizer, the more surface will be exposed to the action of the various agencies in the soil. Superphosphate, when applied to the soil, undergoes a process of reversion. The phosphoric acid of the superphosphate is mostly soluble in water. When superphosphate is applied to land, the soil water will dissolve the phosphate, and bathe, within certain limits, the particles of soil it may reach. Meeting with small particles of lime, iron, and alumina oxides, it enters into combination with them and reverts to a less soluble condition, and is deposited as a thin coating. A more intimate mixture is obtained with the soil by superphosphate than would be got through

the use of basic phosphate. Further, as this fertilizer is prepared by mixing lime with superphosphate, it is reasonable to suppose that no advantage is to be gained by substituting this fertilizer for superphosphate on soil containing a fair percentage of lime.

Fertilizers Act 1915.

TABLE OF UNIT VALUES FOR THE YEAR 1917.

		£	s.	d.
1 per cent. of Nitrogen as Nitrate	is valued at	1	12	3
1 per cent. of Nitrogen as Ammonia	,,	0	19	6
1 per cent. of Nitrogen in Blood	,,	1	0	0
1 per cent. of Nitrogen in Fine Bone	,,	0	16	0
1 per cent. of Nitrogen in Coarse Bone and Bone Fertilizer	,,	0	14	0
1 per cent. of Phosphoric Acid as Water Soluble	,,	0	5	8
1 per cent. of Phosphoric Acid as Citrate Soluble	,,	0	5	0
1 per cent. of Phosphoric Acid in Fine Bone	,,	0	5	0
1 per cent. of Phosphoric Acid in Coarse Bone	,,	0	3	6
1 per cent. of Phosphoric Acid as Citrate Insoluble in roasted and finely ground Phosphate ..	,,	0	4	0
1 per cent. of Phosphoric Acid as Citrate Insoluble in Bone Fertilizers, Bone and Super, Super and Bone	,,	0	3	6
1 per cent. of Phosphoric Acid as Citrate Insoluble in ground Phosphates	,,	0	2	9
1 per cent. of Phosphoric Acid as Citrate Insoluble in Superphosphates, Nitro Supers, and Basic Phosphates	,,	0	1	0

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1915 (No. 2652).

Description of Fertilizer.	Brand.	Nitrogen.	Phosphoric Acid.	Potash.	Price asked for the Fertilizer per ton.	Where Obtainable.
		%	%	%	£ s. d.	
Mainly Nitrogenous.						
Nitrate of Soda	Federal S.N. ..	15·5	..	..	25 0 0	Australian Explosives and Chemical Co. Ltd., 135 William-street, Melbourne
"	Sickle	15·5	..	..	25 0 0	Cuming, Smith and Co. Prop. Ltd., 65 William-street, Melbourne
"	M.L.	15·5	..	..	25 0 0	The Mount Lyell Mining and Railway Company, Ltd., 381 Little Collins-street, Melbourne
"	Wischer and Co. Propty. Ltd.	15·5	..	..	25 0 0	Wischer and Co. Propty. Ltd., 153 William-street, Melbourne
Sulphate of Ammonia	B.G.C.	21·00	..	..	18 0 0	The Ballarat Gas Company, Grenville-street, Ballarat
" "	M.G. Co.	20·59	..	..	18 0 0	The Metropolitan Gas Co., Flinders-street, Melbourne
" "	Federal A.S. ..	20·00	..	..	20 12 6	Australian Explosives and Chemical Co. Ltd., 135 William-street, Melbourne
" "	Sickle	20·00	..	..	20 12 6	Cuming, Smith and Co. Prop. Ltd., 65 William-street, Melbourne
" "	M.L.	20·0	..	..	20 12 6	The Mount Lyell Mining and Railway Company, Ltd., 381 Little Collins-street, Melbourne
" "	Wischer and Co. Propty. Ltd.	20·0	..	..	20 12 6	Wischer and Co. Propty. Ltd., 153 William-street, Melbourne
Blood	W.A. and Co., Imperial	11·00	..	..	11 0 0	W. Angliss and Co. Propty. Ltd., 42 Bourke-street, Melbourne
"	Champion	12·50	2·00	..	..	John Cooke and Co. Propty. Ltd., 534 Collins-street, Melbourne

List of Fertilizers Registered at the Office of the Director of Agriculture under the Fertilizers Act 1915 (No. 2652)—*continued.*

Description of Fertilizer.	Brand.	Nitrogen.	Phosphoric Acid. Water Soluble.	Citrate Soluble.	Citrate In-soluble.	Total.	Price asked for the Fertilizer per ton.	Where Obtainable.
Phosphate, readily Soluble.		%	%	%	%	%	£ s. d.	
Superphosphate ..	Federal O.S. ..	..	17·00	0·50	0·50	18·00	5 0 0	The Australian Explosives and Chemical Co. Ltd., 135 William-street, Melbourne
"	Sickle Florida ..	..	17·00	0·50	0·50	18·00	5 0 0	Cuming, Smith and Co. Pty. Ltd., 65 William-street, Melbourne
"	M.L. No. 1 ..	..	17·00	0·50	0·50	18·00	5 0 0	Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
"	Wischer and Co. Propty. Ltd., No. 1	..	17·00	0·50	0·50	18·00	5 0 0	Wischer and Co. Propty. Ltd., 153 William-street, Melbourne
"	Hasell's ..	..	17·00	0·50	0·50	18·00	5 0 0	Arthur H. Hasell, 17 Queen-street, Melbourne
Concentrated Superphosphate	Federal Conc S ..	..	40·00	4·00	..	44·00	13 10 0	The Australian Explosives and Chemical Co. Ltd., 135 William-street, Melbourne
" "	M.L.	..	40·00	4·00	..	44·00	13 10 0	Mount Lyall Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
" ..	Wischer and Co. Pty. Ltd.	..	40·00	4·00	..	44·00	13 10 0	Wischer and Co. Propty. Ltd., 153 William-street, Melbourne
Containing Nitrogen and Phosphoric Acid, readily Soluble.								
Nitro Superphosphate ..	Federal T.D. ..	1·55*	15·30	0·45	0·45	16·20	6 15 0	The Australian Explosives and Chemical Co. Ltd., 135 William-street, Melbourne
" " ..	Federal N.S. ..	2·08**	13·18	0·38	1·71	15·27	6 15 0	" " " "
" " ..	Sickle T.D. ..	1·55*	15·30	0·45	0·45	16·20	6 15 0	Cuming, Smith and Co. Pty. Ltd., 65 William-street, Melbourne
" " ..	Sickle	2·00**	13·00	0·39	1·61	15·00	6 15 0	" " " "
" " ..	M.L. No. 2 T.D. ..	1·55*	15·30	0·45	0·45	16·20	6 15 0	Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
" " (and or rape manure) ..	M.L.	2·00**	13·00	0·38	1·37	14·75	6 15 0	" " " "
Nitro Superphosphate ..	Wischer and Co. Propty. Ltd. "Key" Fertilizer for grass	1·55*	15·30	0·45	0·45	16·20	6 15 0	Wischer and Co. Propty. Ltd., 153 William-street, Melbourne
" " ..	Wischer and Co. Propty. Ltd.	2·06**	13·92	0·41	0·41	14·74	6 15 0	" " " "

* Containing nitrogen as nitrate of soda.

** Containing 1·50 per cent. nitrogen as sulphate of ammonia

List of Fertilizers Registered at the Office of the Director of Agriculture under the Fertilizers Act 1915 (No. 2652)—*continued.*

Description of Fertilizer.	Brand.	Nitrogen	Phosphoric Acid. Water Soluble.	Citrate Soluble.	Citrate In-soluble.	Total.	Price asked for the Fertilizer per ton.	Where Obtainable.
Containing Nitrogen and Phosphoric Acid, readily Soluble—continued.		%	%	%	%	%	£ s. d.	
Market Garden Manure ..	Federal M.G. ..	3·50††	8·00	0·25	4·75	13·00	7 0 0	The Australian Explosives and Chemical Co. Ltd., 135 William-street, Melbourne
,, ,, ..	Sickle	4·00†	7·65	0·22	2·32	10·19	7 0 0	Cuming, Smith and Co. Pty. Ltd., 65 William-street, Melbourne
,, ,, ..	M.L.	4·00†	7·65	0·22	2·32	10·19	7 0 0	Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
,, ,, ..	Wischer and Co. Propty. Ltd.	4·00†	7·65	0·22	2·32	10·19	7 0 0	Wischer and Co. Propty. Ltd., 153 William-street, Melbourne
Phosphate, moderately Soluble.								
Basic Phosphate ..	Federal B.P. ..	..	..	14·00	3·00	17·00	4 10 0	The Australian Explosives and Chemical Co. Ltd., 135 William-street, Melbourne
,, ,, ..	Sickle	..	..	14·00	3·00	17·00	4 10 0	Cuming, Smith and Co. Pty. Ltd., 65 William-street, Melbourne
,, ,, ..	M.L.	..	..	14·00	3·00	17·00	4 10 0	Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
,, ,, ..	Wischer and Co. Propty. Ltd.	..	..	14·00	3·00	17·00	1 10 0	Wischer and Co. Propty. Ltd., 153 William-street, Melbourne
Phosphate, difficultly Soluble.								
Ground Phosphate ..	Federal G.P. ..	..	..	..	36·65	36·65	5 0 0	The Australian Explosives and Chemical Co. Ltd., 135 William-street, Melbourne
,, ,, ..	Sickle 50 per cent. ..	..	..	..	23·00	23·00	3 10 0	Cuming, Smith and Co. Pty. Ltd., 65 William-street, Melbourne
,, ,, ..	Sickle 60 per cent. ..	..	..	..	27·50	27·50	4 0 0	,, ,, ,, ,, ,,
,, ,, ..	Sickle 80 per cent. ..	..	..	..	36·65	36·65	5 0 0	,, ,, ,, ,, ,,
,, ,, ..	M.L. 50 per cent. ..	..	..	..	23·00	23·00	3 10 0	Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
,, ,, ..	M.L. 60 per cent. ..	..	..	..	27·50	27·50	4 0 0	,, ,, ,, ,, ,,
,, ,, ..	M.L. 80 per cent. ..	..	..	..	36·65	36·65	5 0 0	,, ,, ,, ,, ,,
,, ,, ..	Wischer and Co. Propty. Ltd., 80 per cent.	..	..	..	36·65	36·65	5 0 0	Wischer and Co. Propty. Ltd., 153 William-street, Melbourne

† Containing 1 per cent. nitrogen as sulphate of ammonia.

†† Containing ·75 per cent. nitrogen as sulphate of ammonia.

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1915 (No. 2652)—*continued*.

Description of Fertilizer.	Brand.	Nitrogen.	Phosphoric Acid. Water Soluble.	Phosphoric Acid. Citrate Soluble.	Phosphoric Acid. Citrate In-soluble.	Phosphoric Acid. Total.	Price asked for the Fertilizer per ton.	Where Obtainable.
		%	%	%	%	%	£ s. d.	
Phosphate, difficultly Soluble—continued.								
Ground Phosphate ..	Hasell's Marion Phosphate 60 per cent.	..	..	..	27·50	27·50	4 0 0	Arthur H. Hasell, 17 Queen-street, Melbourne
" " ..	Victoria No. 3 ..	..	..	..	14·00	14·00	2 2 0	Heathcote Chemical Company Proprietary Limited, Sutton-street, North Melbourne
" " ..	Victoria No. 4 ..	..	..	..	11·00	11·00	1 14 0	" " " " "
Roasted and Intensely Ground Phosphate	Victoria	..	..	3·00	12·00	15·00	3 3 6	" " " " "
Nitrogen and Phosphate, moderately Soluble.								
Bone Fertilizer and Superphosphate	Federal B.S. No. 1 ..	1·50	8·50	1·75	6·75	17·00	6 10 0	The Australian Explosives and Chemical Co. Ltd., 135 William-street, Melbourne
Bone and Superphosphate	Gardiner's Bone and Super	1·39	8·00	3·20	5·80	17·00	6 7 6	George Gardiner and Co. Pty. Ltd., Marshalltown, Geelong
" " ..	Sickle (A.) ..	1·50	8·50	3·25	5·25	17·00	6 10 0	Cuming, Smith and Co. Proprietary Limited, 65 William-street, Melbourne
" " ..	Hasell's "A" ..	1·50	8·50	3·00	7·00	18·50	5 14 0	Arthur H. Hasell, 17 Queen-street, Melbourne
" " ..	M.L. No. 1 ..	1·50	8·50	3·25	5·25	17·00	6 10 0	The Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
Super and Bone ..	Wischer and Co. Propty. Ltd. No. 1	1·50	8·50	3·25	5·25	17·00	6 10 0	Wischer and Co. Propty. Ltd., 153 William-street, Melbourne
Bone Fertilizer and Super	Elsworth's ..	1·00	8·00	3·00	6·00	17·00	6 5 0	William Elsworth, corner of York and Joseph streets, Ballarat East
Super and Bone ..	Federal B.S. No. 3 ..	0·75	12·75	1·13	3·62	17·50	5 15 0	The Australian Explosives and Chemical Co. Ltd., 135 William-street, Melbourne
" " ..	Sickle (C.) ..	0·75	12·75	1·37	3·38	17·50	5 15 0	Cuming, Smith and Co. Pty. Ltd., 65 William-street, Melbourne
" " ..	M.L. No. 2 ..	0·75	12·75	1·38	3·37	17·50	5 15 0	The Mount Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
" " ..	Wischer and Co. Propty. Ltd. No. 2	0·75	12·75	1·13	3·62	17·50	5 15 0	Wischer and Co. Propty. Ltd., 153 William-street, Melbourne
Animal Fertilizer ..	Champion ..	6·50	..	4·30	5·30	9·60	..	John Cooke and Co. Propty. Ltd., 534 Collins-street, Melbourne
Blood and Bone Fertilizer	Lighthouse ..	4·50	..	3·00	8·00	11·00	7 0 0	Thomas Borthwick and Sons (Australasia) Ltd., 84 William-street, Melbourne

LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1915 (No. 2652)—*continued.*

Description of Fertilizer.	Brand.	Nitrogen.	Phosphoric Acid. Water Soluble.	Phosphoric Acid. Citrate Soluble.	Phosphoric Acid. Citrate In-soluble.	Phosphoric Acid. Total.	Price asked for the Fertilizer per ton.	Where Obtainable.
Nitrogen and Phosphate, moderately Soluble—continued.		%	%	%	%	%	£ s. d.	
Bone Fertilizer	Gardiner's Special Magic	5·00	..	3·00	10·00	13·00	7 0 0	George Gardiner and Co. Pty. Ltd., Marshalltown, Geelong
Animal Fertilizer ..	A.N.A. Surprise ..	3·00	..	4·00	12·00	16·00	8 10 0	George William Pennell, Braybrook
Bone and Blood Fertilizer ..	Hasell's	7·50	..	4·50	8·00	12·50	11 10 0	Arthur H. Hasell, 17 Queen-street, Melbourne
Bone Fertilizer	Elsworth's ..	2·00	..	6·00	11·00	17·00	6 15 0	William Elsworth, corner of York and Joseph streets, Ballarat East
" "	No. 1 Magic ..	2·00	..	2·00	15·00	17·00	6 5 0	George Gardiner and Co. Pty. Ltd., Marshalltown, Geelong
" "	No. 2 Magic ..	1·50	..	1·50	14·50	16·01	5 17 6	" " " " "
" "	Samson's	2·00	..	2·00	15·00	17·00	6 5 0	" " " " "
" "	"Ark"	3·72	..	3·98	12·90	16·88	6 10 0	Arthur Murphy, Ararat
" "	Horse Shoe ..	3·50	..	4·70	10·70	15·40	6 15 0	P. Fitzgerald and Sons, Warragul-road, Bentleigh
" "	Echuca	4·75	..	8·25	6·75	15·00	6 10 0	W. G. Boyle, Echuca East

Description of Fertilizer.	Brand.	Nitrogen.	Phosphoric Acid.	Mechanical Condition. Fine.	Mechanical Condition. Coarse.	Price asked for the Fertilizer per ton.	Where Obtainable.
		%	%	%	%	£ s. d.	
Bone Dust	J.N.D.—B. ..	4·00	18·00	33·00	67·00	6 15 0	John Newman Day, Day-street, Bendigo
"	Vauxhall ..	3·86	23·25	33·70	66·30	7 10 0	William Moore, Vauxhall Gardens, Panmure
"	Lion	3·85	21·50	31·00	69·00	7 0 0	Alfred Wray, Raymond-street, Sale

Melbourne, 26th November, 1917.

P. RANKIN SCOTT,
Chemist for Agriculture.

SUPPLEMENTARY LIST OF FERTILIZERS REGISTERED AT THE OFFICE OF THE DIRECTOR OF AGRICULTURE UNDER THE FERTILIZERS ACT 1915.

[This list is supplementary to that published in the *Journal of Agriculture* for January, 1917, pp. 19–23.]

Description of Fertilizer.	Brand.	Nitrogen.	Phosphoric Acid.				Price asked for the Fertilizer per ton.	Where Obtainable.
			Water Soluble.	Citrate Soluble.	Citrate In-soluble	Total.		
Nitrogenous Phosphatic, Natural.		%	%	%	%	%	£ s. d.	
Blood and Bone Manure	"Star" Brand ..	5·50	..	6·36	7·03	13·39	10 0 0	Reynolds Bros., Point Nepean-road, Moorabbin
" "	"Lloyd's" Fertilizer	4·06	..	3·20	9·97	13·17	6 0 0	Edward Lloyd, Box Hill
Blood and Bone Fertiliser	"Hasells" ..	7·25	..	4·50	7·50	12·00	10 10 0	Arthur H. Hasell, 17 Queen-street, Melbourne
Nitrogenous Phosphatic, Prepared.								
Bone Fertiliser and Superphosphate	Federal B.S. No. 1	1·50	8·50	1·75	6·75	17·00	6 5 0	The Australian Explosives and Chemical Co. Ltd., 135 William-street, Melbourne
Bone and Superphosphate Mixed	Sickle Bone and Super Mixed A.	1·50	8·50	3·25	5·25	17·00	6 5 0	Cuming, Smith and Co. Prop. Ltd., 65 William-street, Melbourne
" "	M.L. No. 1 Bone and Super	1·50	8·50	3·25	5·25	17·00	6 5 0	The Mt. Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
" "	Wisher's Super and Bone No. 1	1·50	8·50	3·25	5·25	17·00	6 5 0	Wisher and Co. Prop. Ltd., 153 William-street, Melbourne
Superphosphate and Nitrate of Soda	Sickle Nitro Super T.D.	*1·55	15·30	·45	·45	16·20	6 10 0	Cuming, Smith and Co. Prop. Ltd., 65 William-street, Melbourne
" "	Federal Nitro Superphosphate T.D.	*1·55	15·30	·45	·45	16·20	6 10 0	The Australian Explosives and Chemical Co. Ltd., 135 William-street, Melbourne
" "	M.L. Nitro Super No. 2 T.D.	*1·55	15·30	·45	·45	16·20	6 10 0	The Mt. Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
Phosphatic.								
Mansfield Phosphate Rock (Ground)	Victoria Phosphate No. 3	..	..	..	14·00	14·00	2 2 0	Heathcote Chemical Co. Prop. Ltd., Sutton-street, North Melbourne
Nitrogenous Phosphatic, Prepared.								
Blood and Bone, Superphosphate and Ammonium Sulphate	M.L. Market Garden Manure	†4·00	7·65	·22	2·32	10·19	7 0 0	The Mt. Lyell Mining and Railway Co. Ltd., 381 Little Collins-street, Melbourne
" "	Wisher's Market Garden Manure	†4·00	7·65	·22	2·32	10·19	7 0 0	Wisher and Co. Prop. Ltd., 153 William-street, Melbourne
" "	Federal Market Garden Manure (M.G.)	‡3·50	8·00	·25	4·75	13·00	7 0 0	The Australian Explosives and Chemical Co. Ltd., 135 William-street, Melbourne
" "	Sickle Market Garden Manure	†4·00	7·65	·22	2·32	10·19	7 0 0	Cuming, Smith and Co. Prop. Ltd., 65 William street, Melbourne

* Containing nitrogen as nitrate of soda.
† Containing 1 per cent. nitrogen as ammonium sulphate.
‡ Containing ·75 per cent. nitrogen as ammonium sulphate.

Government Agricultural Laboratory,
Melbourne, 8th October, 1917.

P. RANKIN SCOTT,
Chemist for Agriculture.

Fertilizers Act 1915.

LIST SHOWING RESULTS OF ANALYSIS OF SAMPLES OF ARTIFICIAL FERTILIZERS COLLECTED IN VICTORIA UNDER THE PROVISIONS OF SECTION 27 OF THE FERTILIZERS ACT 1915 (6 GEO. V., No. 2652).

Label No.	Description of Manure.	Manufacturer or Importer.	Moisture.	Nitrogen. Found.	Nitrogen. Guaranteed.	Phosphoric Acid. Water Soluble. Found.	Water Soluble. Guaranteed.	Citrate Soluble. Found.	Citrate Soluble. Guaranteed.	Citrate Insoluble. Found.	Citrate Insoluble. Guaranteed.	Total. Found.	Total. Guaranteed.	Price asked for the Manure per Ton.	District in which Sample was Obtained.
			%	%	%	%	%	%	%	%	%	%	%	£ s. d.	
948	Elsworth's Bone Fertilizer and Superphosphate	W. R. Elsworth ..	9·16	0·97	1·00	11·58	8·00	1·65	3·00	6·04	6·00	19·27	17·00	6 0 0	Ballarat
949	Wischer's No. 1 Superphosphate	Wischer and Co. ..	7·93		..	16·48	17·00	1·43	0·50	0·91	0·50	18·82	18·00	4 15 0	Geelong
950	Florida Superphosphate ..	Cuming, Smith, and Co. ..	10·22	..	..	17·39	17·00	1·14	0·50	0·90	0·50	19·43	18·00	4 15 0	Ballarat
951	Cockbill's Superphosphate and Bone No. 2	J. Cockbill	9·72	0·71	0·75	15·05	12·75	1·36	1·38	2·59	3·37	19·00	17·50	6 5 0	Dandenong
953	Bone Fertilizer and Superphosphate (C)	Cuming, Smith, and Co. ..	..	1·01	0·75	13·82	12·75	1·65	1·37	1·57	3·38	17·04	17·50	5 12 6	Metropolitan
954	Mount Lyell Superphosphate No. 1	Mt. Lyell M. and R. Co. ..	..	..	..	17·68	17·00	0·88	0·50	0·56	0·50	19·12	18·00	4 15 0	,,
955	Wischer and Co's. Superphosphate No. 1	Wischer and Co. ..	..	..	..	15·82	17·00	0·67	0·50	1·27	0·50	17·62	18·00	4 15 0	,,
956	,, ,, ,, ,,	,, ,, ..	..	..	..	15·30	17·00	0·76	0·50	1·38	0·50	17·44	18·00	4 15 0	,,
957	Mount Lyell Superphosphate No. 1	Mt. Lyell M. and R. Co. ..	..	..	..	15·27	17·00	0·62	0·50	0·69	0·50	16·58	18·00	4 15 0	,,
958	,, ,, ,, ,,	,, ,, ..	..	..	..	17·77	17·00	0·92	0·50	0·48	0·50	19·17	18·00	4 15 0	,,
960	Wischer and Co's. Superphosphate No. 1	Wischer and Co. ..	..	..	..	16·72	17·00	0·71	0·50	0·20	0·50	17·63	18·00	4 15 0	,,
962	,, ,, ,, ,,	,, ,, ..	..	..	..	17·52	17·00	0·71	0·50	0·59	0·50	18·82	18·00	4 15 0	,,
963	Federal Superphosphate ..	The Australian Explosives and Chemical Co.	..	..	..	17·92	17·00	0·68	0·50	0·70	0·50	19·30	18·00	4 15 0	,,
964	Mount Lyell Superphosphate No. 1	Mt. Lyell M. and R. Co. ..	..	..	..	17·58	17·00	0·68	0·50	0·70	0·50	18·96	18·00	4 15 0	,,
965	Wischer and Co's. Superphosphate No. 1	Wischer and Co. ..	..	..	..	17·42	17·00	0·44	0·50	0·66	0·50	18·52	18·00	4 15 0	,,
966	Federal Superphosphate ..	The Australian Explosives and Chemical Co.	..	..	..	17·99	17·00	0·67	0·50	0·70	0·50	19·36	18·00	4 15 0	,,
967	Wischer and Co's. Superphosphate No. 1	Wischer and Co. ..	..	..	..	16·31	17·00	0·68	0·50	0·52	0·50	17·51	18·00	4 15 0	,,
968	Florida Superphosphate ..	Cuming, Smith, and Co. ..	..	..	..	17·69	17·00	1·22	0·50	0·57	0·50	19·48	18·00	4 15 0	,,
969	Mount Lyell Superphosphate No. 1	Mt. Lyell M. and R. Co. ..	..	..	..	17·56	17·00	0·94	0·50	0·52	0·50	19·02	18·00	4 15 0	,,
970	Florida Superphosphate ..	Cuming, Smith, and Co. ..	..	..	..	17·55	17·00	1·01	0·50	0·50	0·50	19·06	18·00	4 15 0	,,
971	Rohs' Bonedust* ..	P. Rohs Pty. Ltd. ..	5·63	4·34	4·00	..	..	..	..	..	..	19·55	18·00	6 15 0	Bendigo

* Mechanical condition—Coarse bone, 52 per cent. (guaranteed 45 per cent.); fine bone, 48 per cent. (guaranteed 55 per cent.).

List Showing Results of Analysis of Samples of Artificial Fertilizers Collected in Victoria under the Provisions of Section 27 of the Fertilizers Act 1915 (6 Geo V., No. 2652)—*continued.*

Label No.	Description of Manure.	Manufacturer or Importer.	Moisture.	Nitrogen. Found.	Nitrogen. Guaranteed.	Phosphoric Acid. Water Soluble. Found.	Water Soluble. Guaranteed.	Citrate Soluble. Found.	Citrate Soluble. Guaranteed.	Citrate Insoluble. Found.	Citrate Insoluble. Guaranteed.	Total. Found.	Total. Guaranteed.	Price asked for the Manure per Ton.	District in which Sample was Obtained.
			%	%	%	%	%	%	%	%	%	%	%	£ s. d.	
972	J.N.D. Bonedust†	J. N. Day	10·37	4·55	4·23	..	..	..	..	..	..	20·21	20·87	6 5 0	Bendigo
973	Federal Bone Fertilizer and Superphosphate (BS No. 3)	Australian Explosive and Chemical Co.	9·09	0·68	0·75	13·55	12·75	0·95	1·13	4·34	3·62	19·04	17·50	5 12 6	Ballarat
974	Elsworth's Bone Fertilizer and Superphosphate	W. R. Elsworth ..	6·09	1·37	1·00	8·87	8·00	2·83	3·00	7·62	7·00	19·32	18·00	6 0 0	..
975	Florida Superphosphate ..	Cuming, Smith, and Co. ..	10·54	..	..	17·61	17·00	0·61	0·50	0·92	0·50	19·14	18·00	4 15 0	Metropolitan
976	Sickle Superphosphate and Bone (C)	,, ,, ..	9·16	0·75	0·75	15·16	12·75	0·63	1·37	2·16	3·38	18·25	17·50	5 12 6	,,
977	Florida Superphosphate ..	,, ,, ..	10·80	..	..	17·23	17·00	0·93	0·50	0·82	0·50	18·98	18·00	4 15 0	,,
978	Wischer's Superphosphate and Bone No. 2	Wischer and Co. ..	9·67	0·89	0·75	12·74	12·75	0·66	1·13	4·03	3·62	17·43	17·50	5 12 6	Geelong
979	,, ,, ,, ,,	,, ,, ..	10·36	0·73	0·75	11·58	12·75	0·86	1·13	2·41	3·62	17·85	17·50	5 12 6	Metropolitan
980	,, ,, ,, ,,	,, ,, ..	8·01	0·87	0·75	12·88	12·75	1·00	1·13	3·25	3·62	17·13	17·50	5 12 6	Ballarat
981	Wischer's Superphosphate No. 1	,, ,, ..	9·10	..	..	17·13	17·00	0·96	0·50	0·57	0·50	18·66	18·00	4 15 0	..
982	Rohs' Bonedust and Superphosphate	P. Rohs Pty. Ltd. ..	7·58	2·06	1·50	9·00	8·50	3·26	5·25	7·60	4·25	19·86	18·00	5 17 6	Bendigo
983	Rohs' Blood Manure	,, ,, ..	11·61	10·59	8·75	..	..	..	..	..	..	..	..	10 0 0	..
985	A.N.A. Surprise Animal Fertilizer	G. W. Pennell ..	16·20	3·13	3·00	..	..	1·40	1·00	12·44	12·00	16·80	16·00	7 0 0	Braybrook
987	Florida Superphosphate ..	Cuming, Smith, and Co. ..	10·20	..	..	17·56	17·00	0·91	0·50	1·04	0·50	19·51	18·00	4 15 0	Geelong
988	Federal Superphosphate and Bone (BS No. 3)	Australian Explosives and Chemical Co.	6·79	0·67	0·75	14·10	12·75	1·03	1·13	3·80	3·62	18·93	17·50	5 12 6	..
989	Wischer's Superphosphate No. 1	Wischer and Co. ..	10·19	..	..	16·95	17·00	1·54	0·50	1·32	0·50	19·81	18·00	4 15 0	..
990	Mount Lyell No. 1 Superphosphate	Mt. Lyell M. and R. Co. ..	1·39	..	..	20·64	17·00	0·53	0·50	1·00	0·50	22·27	18·00	4 15 0	Metropolitan
998	Wischer's Superphosphate No. 1	Wischer and Co. ..	9·41	..	..	16·37	17·00	0·50	0·50	0·72	0·50	17·59	18·00	4 15 0	..
1500	Mount Lyell Bone and Superphosphate No. 1	Mt. Lyell M. and R. Co. ..	8·31	1·64	1·50	9·56	8·50	1·49	3·25	6·04	5·25	17·09	17·00	6 5 0	..
1501	Sickle Superphosphate and Bone (C)	Cuming, Smith, and Co. ..	8·45	0·76	0·75	15·08	12·75	0·75	1·37	2·33	3·38	18·16	17·50	5 12 6	..
1502	Florida Superphosphate ..	,, ,, ,,	8·28	..	..	18·91	17·00	0·60	0·50	0·67	0·50	20·18	18·00	4 15 0	..
1503	,, ,, ..	,, ,, ,,	10·17	..	..	18·40	17·00	0·61	0·50	0·90	0·50	19·91	18·00	4 15 0	..

† Mechanical condition: Coarse bone, 67 per cent. (guaranteed 67 per cent.); fine bone, 33 per cent. (guaranteed 33 per cent.)

List Showing Results of Analysis of Samples of Artificial Fertilizers Collected in Victoria under the Provisions of Section 27 of the Fertilizers Act 1915 (5 Geo. V., No. 2652)—*continued.*

Label No.	Description of Manure	Manufacturer or Importer	Moisture.	Nitrogen. Found.	Nitrogen. Guaranteed.	Phosphoric Acid. Water Soluble. Found.	Water Soluble. Guaranteed.	Citrate Soluble. Found.	Citrate Soluble. Guaranteed.	Citrate Insoluble. Found.	Citrate Insoluble. Guaranteed.	Total. Found.	Total. Guaranteed.	Price asked for the Manure per Ton.	District in which Sample was Obtained.
			%	%	%	%	%	%	%	%	%	%	%	£ s. d	
1504	Mount Lyell No. 1 Superphosphate	Mt. Lyell M. and R. Co. ..	8·24	..	..	18·15	17·00	0·47	0·50	0·68	0·50	19·30	18·00	4 15 0	Metropolitan
1505	Florida Superphosphate ..	Cuming, Smith, and Co. ..	11·46	..	..	17·68	17·00	0·71	0·50	1·15	0·50	19·54	18·00	4 15 0	,,
1506	Wischer's Superphosphate No. 1	Wischer and Co. ..	9·32	..	..	17·73	17·00	0·44	0·50	0·67	0·50	18·84	18·00	4 15 0	,,
1507	Wischer's Superphosphate and Bone No. 2	,, ,, ..	9·19	0·74	0·75	13·98	12·75	0·86	1·13	2·19	3·62	17·03	17·50	5 12 6	,,
1508	Florida Superphosphate ..	Cuming, Smith, and Co. ..	11·02	..	..	17·66	17·00	0·51	0·50	1·19	0·50	19·36	18·00	4 15 0	,,
1509	Mount Lyell Superphosphate No. 1	Mt. Lyell M. and R. Co. ..	10·34	..	..	17·13	17·00	0·55	0·50	1·13	0·50	18·81	18·00	4 15 0	,,
1510	,, ,, ,, ,,	,, ,, ..	10·14	..	..	17·07	17·00	0·57	0·50	1·07	0·50	18·71	18·00	4 15 0	,,
1511	Mount Lyell Superphosphate and Bone No. 2	,, ,, ..	7·92	0·76	0·75	13·42	12·75	0·77	1·13	3·30	3·62	17·49	17·50	5 12 6	,,
1512	Wischer's Superphosphate No. 1	Wischer and Co. ..	9·64	..	..	16·52	17·00	0·45	0·50	0·69	0·50	17·66	18·00	4 15 0	,,
1513	Florida Superphosphate ..	Cuming, Smith, and Co. ..	9·93	..	..	18·27	17·00	0·79	0·50	0·99	0·50	20·05	18·00	4 15 0	,,
1514	Mount Lyell No. 1 Superphosphate	Mt. Lyell M. and R. Co. ..	10·99	..	..	16·82	17·00	0·58	0·50	0·77	0·50	18·17	18·00	4 15 0	,,
1517	Mount Lyell Nitro-Superphosphate	,, ,, ..	7·86	‡1·96	2·00	13·73	13·00	0·89	0·38	1·81	1·37	15·43	14·75	6 10 0	,,
1518	Wischer's Bone and Superphosphate No. 1	Wischer and Co. ..	9·17	1·28	1·50	10·79	8·50	1·49	3·25	4·65	5·25	16·93	17·00	6 5 0	,,
1519	Market Garden Manure ..	,, ,, ..	8·89	§3·89	4·00	7·85	7·65	1·52	0·22	2·37	2·32	11·74	10·19	7 0 0	,,
1520	Florida Superphosphate ..	Cuming, Smith, and Co. ..	9·53	..	..	16·98	17·00	0·34	0·50	0·65	0·50	17·97	18·00	4 15 0	,,
1521	Sickle Bone and Superphosphate Mixed (A)	,, ,, ,,	9·69	1·59	1·50	10·96	8·50	1·39	3·25	4·09	5·25	16·44	17·00	6 5 0	,,
1522	Mount Lyell Market Garden Manure	Mt. Lyell M. and R. Co. ..	9·25	‖4·23	4·00	8·22	7·65	1·72	0·22	1·35	2·32	11·29	10·19	7 0 0	,,
1523	Star Brand Blood and Bone Manure	Reynolds Bros., Moorabbin	6·33	6·74	5·50	..	..	5·18	6·36	7·21	7·03	12·39	13·39	10 0 0	,,
1524	Mount Lyell No. 1 Superphosphate	Mt. Lyell M. and R. Co. ..	10·06	..	..	17·38	17·00	0·55	0·50	1·26	0·50	19·19	18·00	4 15 0	,,
1525	Wischer's Superphosphate No. 1	Wischer and Co. ..	9·50	..	..	16·11	17·00	0·59	0·50	0·94	0·50	17·64	18·00	4 15 0	,,
1526	Bone and Superphosphate No. 1, M.L.	Mt. Lyell M. and R. Co. ..	6·43	1·66	1·50	9·37	8·50	1·91	3·25	5·86	5·25	17·14	17·00	6 5 0	,,
1527	Sickle Florida Superphosphate ..	Cuming, Smith, and Co. ..	9·47	..	..	17·19	17·00	0·43	0·50	0·70	0·50	18·32	18·00	4 15 0	,,
1528	Sickle Nitro-Superphosphate ..	,, ,, ..	10·58	¶2·00	2·00	13·18	13·00	0·38	0·39	1·12	1·16	14·68	15·00	6 10 0	,,

‡ Nitrogen as ammonia, 1·61 per cent. § Nitrogen as ammonia, 1·27 per cent. ‖ Nitrogen as ammonia, 1·13 per cent. ¶ Nitrogen as ammonia, 1·51 per cent.

REGULATIONS, ETC., FUNGICIDES ACT.

The following regulations under the Fungicides Act, which have been approved by the Executive Council, will probably be of interest to our readers:—

2. The label to be used in connexion with the sale of any fungicide, insecticide. vermin destroyer, or weed destroyer shall be plainly printed or written in black ink or other indelible substance. Every label to be affixed to a parcel or packet not exceeding one pound in weight shall be in size two inches long by two inches in breadth, and to parcels or packets exceeding one pound in weight it shall be in size at least four inches long by two inches in breadth.

3. The percentage of arsenic trioxide (AS_2O_3) contained in any fungicide, insecticide, vermin destroyer, or weed destroyer shall be shown on the label.

4. The percentage of arsenic trioxide (AS_2O_3) contained in arsenic shall be shown on the label.

5. The percentage of arsenic pentoxide (AS_2O_3) contained in any fungicide, insecticide, vermin destroyer, or weed destroyer shall be shown on the label.

6. In any fungicide, insecticide, vermin destroyer, or weed destroyer made or prepared from lime and sulphur the percentage of sulphur rendered soluble and the amount of dilution with water required to make the spray suitable for use shall be shown on the label.

7. The percentage of each principal active ingredient contained in any fungicide, insecticide, vermin destroyer, or weed destroyer shall be shown on the label.

8. The percentage of nicotine contained in any preparation of tobacco shall be shown on the label.

9. In the case of oil emulsions sold as fungicides or insecticides the percentage of light oil shall be shown on the label.

10. In the case of fungicides or insecticides containing an essential oil the percentage of essential oil shall be shown on the label.

11. In the case of fungicides or insecticides containing coal tar or coal tar derivatives the percentage of phenol shall be shown on the label.

12. In the case of fungicides or insecticides containing compounds of calcium the percentage of calcium hydrate (CaH_2O_2) uncombined or of calcium oxide (CaO) uncombined shall be shown on the label.

13. In the case of potassium cyanide or sodium cyanide or mixtures of the two when used as or in the preparation of a fungicide, insecticide, vermin destroyer, or weed destroyer, the percentage of cyanide calculated as potassium cyanide (KCN) shall be shown on the label.

14. In the case of formaldehyde or solutions or preparations containing folmaldehyde when used as or in the preparation of a fungicide, insecticide. vermin destroyer, or weed destroyer, the percentage of formaldehyde which is present in or may be evolved from such solution or preparation shall be shown on the label.

15. The quantity of water to be added to any arsenical preparation to make a suitable dipping fluid to be used for dipping cattle and the amount in pounds of arsenic trioxide (AS_2O_3) contained in every 400 gallons of the dipping fluid so prepared shall be shown on the label.

16. The quantity of water to be added to any preparation to make a suitable dipping fluid to be used for dipping sheep and the names and quantities in pounds of the active ingredient or ingredients contained in every 400 gallons of the dipping fluid so prepared shall be shown on the label.

17. In the case of mixtures of any proclaimed fungicides, insecticides, vermin destroyers, or weed destroyers, the proportion of such fungicides, insecticides, vermin destroyers, or weed destroyers shall be shown on the label.

18. Any purchaser of a fungicide, insecticide, vermin destroyer, or weed destroyer may immediately on purchase of same give written notice to the person in charge or apparently in charge of the premises of his intention to have the same analyzed, and shall offer in his presence to—

(*a*) divide a sample into three approximately equal parts;

(*b*) place each such part in a separate package and seal or fasten each such package;

(*c*) place on each such package a label stating the name so far as known to him of the occupier of the premises or of the person apparently having possession, custody, or control of the lot from which such sample was taken, and the date and time of taking;
(*d*) deliver one of such parts to the person in charge or apparently in charge of the premises;
(*e*) retain one of such parts for future comparison, and
(*f*) forward the other of such parts together with the prescribed fee for the analysis of same to the Chemist, Department of Agriculture, Melbourne.

When a fungicide, insecticide, vermin destroyer, or weed destroyer is sold in packages containing not more than two pounds avoirdupois net weight thereof, the conditions of this clause shall be deemed to have been complied with if three unopened packages of the preparation are dealt with in the manner indicated under (*c*), (*d*), (*e*), and (*f*) above as if they were the three parts into which the sample is to be divided.

The Inspector appointed under the provisions of this Act may take all measures considered necessary to enforce the requirements of the Act regarding a defective sample so submitted.

FEES.

19. The following fees are prescribed for the services referred to:—

	s.	d.
For each analysis of a vermin destroyer	10	6
For each analysis of a weed destroyer	10	6
For each constituent estimated in a fungicide or insecticide	10	6

PENALTIES.

20. Any person who shall be guilty of a breach of or who shall fail to comply with these Regulations shall be liable to a penalty for the first offence not exceeding Five pounds and for any subsequent offence not exceeding Twenty pounds.

Hereunder is an extract from a proclamation regarding the standard quality of materials intended for use as fungicides, &c.

Arsenate of Lead.—Lead Arsenate is any compound of Arsenic and Lead. It shall contain not less than 25 per centum of Arsenic Pentoxide (AS_2O_5) combined with Lead and not more than 1 per centum of water-soluble Arsenic compounds calculated as Arsenic Pentoxide (AS_2O_5) both calculated on the dry basis.

Arsenic shall be of one of the following standards:—

(1) Pure Arsenic shall contain not less than 98 per centum of Arsenic Trioxide (AS_2O_3).
(2) Commercial Arsenic shall contain not less than 88 per centum of Arsenic Trioxide (AS_2O_3).
(3) Impure Arsenic is Arsenic containing less than 88 per centum of Arsenic Trioxide (AS_2O_3).

Bordeaux Mixture, Bordeaux Paste, or Bordeaux Powder is essentially Basic Sulphate of Copper, and shall contain Basic Sulphate of Copper equivalent to not less than 50 per centum Sulphate of Copper ($CuSo_45H_2O$) calculated on a dry basis, and shall not contain an appreciable quantity of uncombined Copper Sulphate.

Copper Acetate is neutral Acetate of Copper. When used as or in the preparation of a fungicide, insecticide, vermin destroyer, or weed destroyer, it shall contain not less than 30 per centum of copper calculated on the dry basis.

Copper Sulphate or *Bluestone* is a compound of Copper, Sulphuric Acid, and water. When used as or in the preparation of a fungicide, insecticide, vermin destroyer, or weed destroyer, it shall contain not less than 98 per centum of pure Copper Sulphate ($CuSo_45H_2O$).

Crude Petroleum Emulsion or any preparation of crude petroleum shall contain at least 50 per centum of Crude Petroleum.

Lime is the product obtained by burning Calcium Carbonate. When used as or in the preparation of a fungicide, insecticide, vermin destroyer, or weed destroyer, it shall contain not less than 85 per centum of Calcium Oxide (CaO),

and not more than 5 per centum of Calcium Carbonate ($CaCO_3$), and not more than 2 per centum of Magnesium Oxide (MgO).

Lime-Sulphur is any preparation or compound made from Lime and Sulphur. When used as or in the preparation of a fungicide, insecticide, vermin destroyer, or weed destroyer, it shall be wholly soluble in water.

Oil Emulsions.—Red Oil Emulsion or any preparation of Red Oil shall contain at least 50 per centum of Red Oil, and shall not contain any residual oil.

Paris Green is Aceto-Arsenate of Copper. It shall contain not less than 50 per centum of Arsenic Trioxide (AS_2O_3), and not more Arsenic in water-soluble form than is equivalent to 3½ per centum of Arsenic Trioxide (AS_2O_3).

Sodium Arsenate is any compound of Arsenic Trioxide (AS_2O_3) and Soda.

Standard Cattle Dip is any concentrated dipping fluid to which the term "Standard" is applied. It shall contain, when diluted in accordance with directions which shall be shown on the label, not less than eight pounds of Arsenic Trioxide (AS_2O_3) in solution, not less than one-half of a gallon and not more than one gallon of Stockholm Tar, not less than two pounds of Soap or its equivalent of Tallow or Saponifiable Oil, and not less than two pounds and not more than four pounds of Caustic Soda or its equivalent in Sodium Carbonate in every 400 gallons of the dipping fluid.

Sulphur is the element sulphur whether in its natural or refined state. When used as or in the preparation of a fungicide, insecticide, vermin destroyer, or weed destroyer, it shall be designated in accordance with its mode of production, such as "Flowers of Sulphur," "Sublimed Sulphur," "Precipitated Sulphur," "Roll Sulphur," "Natural Sulphur," &c., &c.

Tar used in the preparation of dipping fluids shall mean Stockholm tar, pine tar, or wood tar, which shall be free from mineral or coal tar.

Verdigris is essentially Basic Acetate of Copper. When used as or in the preparation of a fungicide, insecticide, vermin destroyer, or weed destroyer, it shall contain not less than 32 per centum of copper calculated on the dry basis.

Vermin Destroyer.—Any special preparation used as a vermin destroyer shall be designated in accordance with its principal active ingredient, as for example, "phosphorus vermin destroyer," "strychnine vermin destroyer," "arsenic vermin destroyer," &c. Phosphorus vermin destroyer shall be of such a nature that when prepared for use according to the directions given by the manufacturer or vendor, and placed in close contact with dry wood, wood shavings, dry grass, or dry straw in an air oven at a temperature of 180 degrees Fahrenheit for three hours, it shall not cause the ignition of such substance on stirring.

BEET FOR SHEEP.

New Zealand Experiments.

Feeding Value of Silver Beet.

In New Zealand there is something of a boom in the cultivation of silver beet as feed for sheep; and the attention of fat lamb raisers and others in Australia should be directed to a plant that, even allowing for all differences of climate, should give a good account of itself on the mixed farm where sheep take their proper place in the rotation.

Its freedom from insect pests and fungoid diseases, its great prolificacy in producing a wealth of stem and leaf (giving in New Zealand quite six feedings-off with sheep in twelve months' time from date of first feeding), its resistance to drought and severe frosts, its apparent freedom from the properties that cause scour or bloat in sheep, the appreciation of all classes of farm stock for it (trials having proved that it is relished before rape, kale, or roots), and its fairly high-feeding value, place it in the forefront of forage and root crops grown for stock in New Zealand at the present time. The remarkable results obtained in 1912 at the Canterbury Frozen Meat

Company's experiment farm at Belfast, and at other farms in the South Island, where co-operative field experiments were conducted, prove in a practical way its possibilities for the feeding and fattening of all farm animals. At Belfast, a quarter of an acre was sown with silver beet on the 9th October, 1911, and was ready to feed off in the last week of February, 1912. Owing, however, to a flush of other food, the silver beet was not used for stock feeding until March, 1912, from which date until the 1st March, 1913, it was stocked at intervals with sheep, and fed off six times. The results from this quarter-acre show that one acre would approximately carry 1,014 sheep for 84 days. The weight of stems and leaves was 210 tons per acre, this weight of forage being produced within twelve months from the date of first stocking. It should be emphasized that the plants were by no means exhausted after the sixth feeding, and would have continued to give further feedings but for the fact that too long a period had been allowed to elapse between one or two of the foldings. Some of the plants had thereby thrown out seedstalks, with the result that their feeding value for subsequent growth was impaired. It was therefore decided not to keep further records.

The value of silver beet in the fattening of sheep was further demonstrated by several feeding tests conducted last year; in two instances the sheep put on at the rate of 1 lb. a day live weight. Silver beet demands careful management in feeding off. Let the farmer never make the mistake of growing more silver beet than he can effectively control and feed off completely at the right periods. It is a crop that cannot be trifled with. It is, indeed, only when silver beet is managed to the best advantage that its great value as a forage crop is realized. Care must be taken not to allow the plant to seed.

The crop is generally fit for feeding in about four months from sowing. Immediately the outer leaves show an indication of taking on a yellow tinge the stock should be put on the crop, and here comes in the first danger. The procedure depends upon the number of sheep to be fed. The hurdles or break-fence should be placed to enable the sheep to feed off the beet in seven to nine days, or in a shorter period if possible. The plant shoots away very rapidly after being eaten down, and should stock remain upon it a day too long they would eat the young shoots coming away, and therefore retard the second growth. The principal feeding off of silver beet is not obtained in the first, but in the following season. Therefore, the main object of the grower should be to nurse and conserve the crop, in order that the most valuable forage to be secured in a subsequent season may be as abundant as possible. Say that the first feeding has taken place in March; then the second feeding should be obtained in June. The plant will continue to grow throughout the winter, and in the spring it provides its best and most abundant forage. It is at this time of the year that silver beet shows up to the greatest advantage. But even with the remarkable spring feed it affords, silver beet, if properly managed, will again provide good feed about the following March, and again in mid-winter —a fact proved by the experience at Belfast, N.Z., where the 1911-sown crop provided excellent feed in March, 1913, and was ready in a month again for another feeding.

—*The Farmer,* Perth.

INSTINCTIVE CHOICE OF FOOD AND WATER BY STOCK.

By E. W. Murphy, Dairy Supervisor.

It is remarkable how cattle will seek special substances which their systems need owing to defects in the food supply. Top dress a part of a field where cripples and paralysis are prevalent, and then observe the fondness of the stock for the treated portion. In country where long-continued stocking has caused exhaustion of the soil, bone-chewing by cattle is quite a usual thing. How do the animals know that the bone contains phosphoric acid and lime? They cannot be seeking for fat, as any bone at all is chewed, and bone ashes will be eaten with avidity if placed within their reach, and will produce a very marked improvement in their health. The eating of dead rabbits by cows—so common in some districts—is an undoubted sign of a lack of minerals in the herbage.

It is surprising to note, in some districts where bores or wells have been put down, that cattle will refuse to drink the water in dams supplied by surface catchment when they have tasted the supply from under ground. Near Penshurst there is a farm which has a large, clean dam, which was cut off by the railway line from a portion of the paddock, and for the waterless part a well was sunk and a hand pump erected. The owner, an aged man, desirous of avoiding unnecessary pumping, sometimes drives the cows to the dam to induce them to drink from it, but without success, and they will wait for hours for an opportunity to go to the trough for the mineral water, which has markedly improved their condition. On another farm not far away the water supply is from a bore, and the water, though mineralized, evidently does not contain enough lime, as the cows eagerly lick the limewash off the cow-shed.

Frequently I have been informed of cows eating rabbit droppings. The explanation of this is that the animals are seeking phosphoric acid—a substance in which the excreta of rabbits is usually rich, as a result of their feeding on the best grass and roots.

Salt-bushes are known to be very nourishing and wholesome feed, but, unless protected, they are soon eaten out. It is very strange that pastoralists should neglect these valuable plants, which would materially lighten the troubles of dry periods.

I am acquainted with a dairy farm on a bank of the Wannon where dandelions grow freely. The owner has an outer block upon which cows become weak and crippled, and it has been noticed that when they are brought to the river paddock they show a decided preference for the dandelion, and quickly improve in condition. Apparently the deep-rooting plants have some tonic virtues, and they are believed to act also as a digestive stimulant. In many of the better cow paddocks near Hamilton dandelions grow abundantly, while the areas most troubled with paralysis have very little of this plant. Yet I have recently seen a field in the Coleraine district with plenty of dandelion growing on it when all the stock was very badly crippled. This paddock,

however, was on a tableland, and the herbage, other than dandelions, was of an inferior quality, such as blue and scarlet pimpernels, sorrel, and lobelia, which are all of a tonic nature. On a small holding such as this cattle have not much opportunity for instinctive choice, but if there is a bone they will not miss it, and licks of salt will be much appreciated.

POINTS ABOUT JIBBING HORSES.

Methods of Management.

One of the most exasperating experiences a man can have is to buy a good-looking horse and find, when he puts him to work, that he is a jibber. So confirmed are some animals that when full strength is required, they "chuck it up," and will not pull an ounce. If an aged horse he is incurable, and can never be relied on, so the sooner he is passed out the better. What makes a horse jib? Most young horses, if properly handled, take to the collar freely enough to start with. There are ample reasons why. Many a good-tempered, free puller has been ruined by overloading and overdriving before the muscles of his shoulders have become seasoned to the pressure of the collar. The driver of a young horse should never expect him to pull a load to start with. The task should be gradually increased as the horse becomes accustomed to the work, and gains confidence as his shoulders harden. In all cases a man should be watchful and see that his horse, especially if a young one, is not getting winded or showing signs of over-fatigue by breaking out suddenly into a heavy sweat. Before he stops of his own accord pull him up with a sharp "whoa"; lift the collar and let his shoulders cool for a minute or two; do something to the harness while he gets his wind. By doing this the animal goes freely again, and is not cowed. If the shoulders are over-heated and tender, and he is out of wind, violent means to make him go render him frightened, then obstinate, and on the right track to become a jibber.

Why a Horse Jibs.

Many horses are unreliable pullers and real jibbers when a heavy lift is required, through bad "seating" for the collar. In some the muscles of the neck come out to the point of the shoulder in quite a ridge. On such a horse the collar never sits steady, and when an extra pull is necessary its pressure is all on that muscle and not evenly distributed. A horse with a neck like that will never be able to stand up to a heavy lift like the one with shoulders that seat the collar more comfortably. He jibs because he cannot stand the strain, and to attempt to make him go with the whip renders him worse. There are horses which are born rogues, whether draught, light harness, hacks, or racehorses, the last-named very frequently to the dismay of the owner and backers. A harness horse should never be allowed to begin jibbing. By carefully observing how he is going the driver can usually circumvent it. Many spirited free-goers have naturally tender shoulders, and after a spell, if

only for a week or two, become a bit "collar proud." Such a horse should never be suddenly asked to do heavy pulling before he has had a turn round in an empty dray or any other light work to get his shoulders thoroughly warm. To bluster and bounce such a horse is the sure way to make him, if not a jib, certainly a rogue. Another cause of jibbing is over-driving, when, perhaps, the horse is winded, and stops virtually from exhaustion. Whipping it on again, and, as some bad drivers do, keep on whipping when the animal is going its best, is not the thing. This treatment will ruin any young horse, because, whether he goes or stops, he is being whipped.

An Instance Given.

An example shows the effect of such treatment. A good spring-cart mare was being broken in to harness by an impetuous man. The mare took to the collar beautifully, and was driven all over the place. After dinner the man put it in again for another run, with the collar cold and the shoulders tender. She would not start. The cart was pushed into the street, and the driver commenced to flog her. Being spirited, she played up, but eventually went off at a great pace, with the owner still flogging her. Next day the performance was worse, and eventually what originally was the making of a good worker, took to jibbing and throwing herself down. She was turned out as of no use. After having a spell she was sold to a widow, who knew nothing about the animal's reputation. Taking her kindly, and not overloading her to start with, and by looking after the shoulders, the widow (who had not been taken in, as some had thought) made a thoroughly staunch worker of what was sold as a jibber, but was nothing of the sort. The habit was not confirmed, and after the spell, being tractable and handled properly, she was all right.

Another Illustration.

Another illustration of a rogue and jibber combined can be quoted. This was a horse with a bad shaped, prominent muscle. A farmer broke it in at light ploughing and harness work. The horse was a bit heavy for his buggy, and was sold to a tradesman, who had country rounds and often heavy loads. The animal was most difficult to fit with a collar that would not rock. However, he was put to work, and some days would go fairly well, and on others work or stop when and where he liked. To flog him was no good. Only one driver could get that horse to do his round. This man used to watch his every action, and at the first sign of stopping would pull him up, get down, rattle the back of the cart, look round the harness, &c., for a minute or two, then get up and start him off again. By adopting this plan that man got him to work fairly well, but with others he would stop dead, and all the known expedients, or flogging, to make him go, were of no avail. He started when he liked. What was wrong here was a bad-shaped neck, bad seating for the collar, combined with a roguish temper. This horse was quiet in every way, but unreliable, and always would be. The life of a driver of a jibbing horse is never monotonous, because he must be ever on the watch to stop him before the animal stops himself. By practising this system regularly, and not overloading at first, many a reputed jib can be turned into a fairly reliable worker, which a thorough rogue never

will be. Having pitched battles with horses inclined to jib nearly always end either in the man's defeat or in spoiling the horse. If a mare is a confirmed rogue, or bad tempered, it is not advisable to breed from her, as the progeny are likely to inherit her bad qualities.—"H.R.," in *The Weekly Times*.

POTASH.

ITS NEED AND SOURCES.

Prior to the war the German Kali or Potash Syndicate absolutely controlled the potash industries of the world, the output from the famous mine at Stassfurt alone being nearly £6,000,000 worth of material a year. The hold that had been secured was quickly made manifest, for as accumulated stocks became exhausted, the prices of all potash salts advanced to a very high figure. Caustic potash advanced from £36 per ton to £400 per ton. Pearl ash, potassium chloride and sulphate are unprocurable. The effect of this has been felt in all industries requiring potash, and in agriculture the position is really serious, for, as potassium sulphate—which is the principal compound used as the source of potash in fertilizing manures—is practically unobtainable, this necessary and important salt is left out of all fertilizers at present on the market.

All authorities agree that potash is essential for the maintenance of the soil's fertility, and, to show the justification for this agreement, and the serious results that will ensue by the removal of potash from fertilizing mixtures, the results of experimental plots of potatoes will be of interest. Using the ordinary fertilizing mixture without potash, a yield of only 2 tons 16 cwts. was obtained, as against 8 to 10 tons per acre with potash present.

In experiments with mangel-wurzels by the addition of potash, the total yield was increased from 12 to 29 tons, and the sugar yield from 0.797 ton to 2.223 tons. All soils, excepting volcanic and granitic in the virgin state, require potash. Plants which secrete quantities of sugar, starch, and other carbohydrates, such as beets, sorghum, potatoes, onions, maize, likewise the various kinds of fruits, require much potash for their development.

Apart from the increased yields by the addition of potash, it is specially noteworthy that its presence imparts increased vigour to plants, and thus enables them to resist diseases to which they may be subject. We in Australia are drawing on the reserves of potash present in the soil, and it may, in some cases, be some time before its loss is made manifest; but already in Queensland, where pineapples and bananas are grown, the reserve is exhausted. In the fruit-growing districts of New South Wales, also, these crops are suffering from the lack of potash.

The position is no doubt serious, but remediable, for the sources from which potash may be obtained are many and various. In Europe and America, efforts are being made to establish the potash industry, and investigations instituted in order to secure the necessary salts under

the most economical conditions. In Australia, the matter has been engaging the attention of the Commonwealth Advisory Council of Science and Industry. The chief possible sources of potash are:—(1) The ashes of various plants, seaweeds. (2) The water in which sheep's wool has been scoured. (3) Brines and residues of salt lakes. (4) Residues from the manufacture of cane sugar, &c. (5) Fume, as obtained from cement works as flue dust. (6) Potash-bearing rocks, as alunite, leucite, felspar, mica, &c.

The Council came to the conclusion that, of all these possible sources, alunite was the most immediately promising. It was necessary, however, first to ascertain by experiment the best method of extracting potash from the local deposits of this mineral, since each deposit of alunite varies somewhat in composition, necessitating differences in treatment. The experiments were carried out at the Melbourne University by Mr. F. W. Janes, working under a committee consisting of:—Mr. A. J. Higgin, lecturer in metallurgy; Professor Orme Masson, professor of chemistry; and Mr. V. G. Anderson. The results of the experiments, together with much information as to alunite, and especially as to the deposits in Australia, have now been published as Bulletin 3 of the Advisory Council, which can be obtained post free from the Secretary, at 314 Albert-street, East Melbourne.

There are at present three known deposits of alunite in Australia—two being in South Australia—one at Carrickalinga Head, on St. Vincent's Gulf, about 40 miles south of Adelaide; and the other near Warnertown, 17 miles from Port Pirie.

The alunite from Carrickalinga Head is of exceptional purity and evenness of composition, with a high and very uniform potash value. In the deposit at Warnertown, though of high grade, yet the proportion of soda to potash somewhat diminishes its value. The third, which has been described as the biggest deposit of alunite in the world, and from which shipments have been made to England for many years, is found at Bulahdelah, New South Wales, about 60 miles north of Newcastle. Alunite is a hydrous sulphate of aluminium and potassium, but, generally speaking, it contains, in addition, sodium, silica, oxide of iron, lime, magnesia, chlorine, and phosphoric acid. It usually occurs as a massive, finely-granular rock, or in nodular masses, varying in colour from white to red, according to the nature and extent of the impurities present—the pure mineral being white. It is insoluble in all acids except strong sulphuric acid upon heating, but is readily soluble in caustic alkalies. Under varying methods of treatment, and at different temperatures, it yields products of considerable industrial importance, such as potash alum, aluminium sulphate, alumina, potassium sulphate, and sulphuric acid. As potash for fertilization is perhaps at present the most necessitous of our requirements, it may be pointed out that the results of experiments carried out by the Bureau of Soils, Washington, United States of America, show that roasted alunite was, on the average, more effective than either high-grade potassium sulphate or chloride. The increase of crops resulting from the addition of raw alunite was 14 per cent., roasted alunite gave 40 per cent., and potassium sulphate and chloride showed about 38 and 31 per cent. respectively, corresponding amounts of potash being used in each case. The best results were

secured with from 50 to 100 lbs. per acre. These facts indicate that we have at our disposal a fertilizer for the supply of the much needed potash salts.

The Bulahdelah deposits are in a most favorable position to furnish a product of this description, and can be treated at a low cost. The plant required would not involve a large outlay of capital, and the process is so simple that no difficulty should be found in successfully carrying it out from the start. It should at the same time be recognised that the ultimate success of this industry depends on the treatment to be accorded to the German Potash Syndicate in the future. If the German imports are stopped, or the supply of potash is not available as at present, then alunite offers the simplest solution of the problem for the quick production of a high-grade product at a reasonable outlay, with every guarantee of success. The problem is not so much a chemical or mechanical as an economic one. Given favorable conditions, Australia should be easily able to supply her needs of potash salts without delay from her deposits of the mineral alunite.

—Communicated by the Commonwealth Advisory Council of Science and Industry.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Pomologist.

The Orchard.

If the work has not already been done, the orchard should be kept in constant cultivation so as to conserve the abundant spring rains. Should the summer become hot and dry, this will be a very necessary precaution. Even where the soil had been previously well cultivated, the cultivators should again be run over the surface, as any hot weather will cause the soil to crust, which would be the means of dissipating a very considerable amount of soil water. Every effort should be taken to retain this moisture, so that the fruit crops shall have all they require for their perfection. To further attain this end, no weeds should be allowed to grow in orchard soils.

Budding.

Young trees, or old trees that have been previously cut down in preparation for budding, may be worked towards the end of the month. It is advisable to select dull, cool weather for this operation, so that the sap may run more freely, and that atmospheric conditions may not have too drying an effect on the bud. The operation of budding is a very simple one, and is easily performed. To gain a successful end, the sap should be flowing freely, so that when the cuts are made the bark should "lift" or "run" easily, and without any clinging or tearing of the fibres, and it should separate freely from the wood. The bud selected should be firm and well matured, and should show no signs of premature

growth whatever. It should be cut from the scion with a shallow cut, and if any wood be left in the cutting it should be taken out of the bud. A smooth, clean spot should be selected on the bark of the stock, and a T-shaped cut made, the vertical cut being longer than the horizontal one. The bark at the point where the cuts meet should be raised, and the bud inserted between the bark and the wood of the stock. The bud should be gently pressed down into position, and then bound with soft twine, string, or raffia. If the bud be too long for the cut, the top may be cut off level by means of a horizontal cut. With practice, it will soon become possible to take the buds so that they will need neither cutting nor trimming.

After two or three weeks the buds should be examined to see if they have "taken," that is, if the bud has united thoroughly to the stock. When this occurs, the tie may be cut. If a growth be desired at once, all wood above the bud may be cut off some short distance above the bud, so as to prevent any bark splitting, and consequent loss of the bud, and so as to throw the bud out at a fair angle. Ultimately this should be properly trimmed.

If desired, the bud may be left dormant throughout the autumn and winter till spring. In this case, the branch should not be cut off, but left on till the usual winter pruning.

Summer Pruning.

The profuse spring rains have caused a vigorous growth in the fruit trees. In order to more economically utilize this abundant growth, it should be now summer pruned, particularly on the apple and pear trees. Care should be observed that as much of the leafage as possible is retained on the tree. Unduly long laterals of fruiting trees may be shortened back, always cutting to a leaf. Unnecessary terminal leader growths, of which there are sometimes three or four, all strong growing, may be reduced to one, retaining this one as a leader. In no case should this growth be cut or interfered with in any way.

The results of these cuts will be to divert the sap which was flowing into growths that would subsequently be pruned, into more profitable channels, so that weak buds and growths may be strengthened, and induced into fruit bearing.

Vegetable Garden.

The work in this section is much the same as in the flower garden. Good mulching and regular soil stirring will be the work for the month. As soon as any bed is cleared of vegetables, it should be manured and well dug over in preparation for the next crop. Deep digging is always desirable in vegetable growing. If any pest, such as aphis, or caterpillars, or tomato weevil, have been present, it would be advisable to burn all the crop refuse, or to destroy any insects that remain, and to give the plot a dressing of gypsum, or of Clift's manurial insecticide.

Keep the tomatoes well watered, and manured, pinching out surplus and strong grown laterals. In early districts the onion crop will be ripening. In late districts, or with late crops, the ripening may be

hastened by breaking down the top. An autumn crop of potatoes may be planted. Cabbage, cauliflower, lettuce, and celery plants may be planted out.

Flower Garden.

January should be a busy month in the garden. It may be necessary to water frequently, and after every watering the surface should be well loosened, and stirred with the hoe to keep it moist and cool. More cultivation and less water is a good rule to be observed. The hoe should be used more, and the hose less in summer, greater benefits will accrue, and the water bill will be considerably reduced. Mulchings with straw, grass, &c., are very useful just now. The mowings from laws form valuable mulching. Waste tobacco stems are also valuable as a mulch.

Dahlias, chrysanthemums, and other tall-growing, slender herbaceous plants will require support in the way of stakes. They will also need mulching considerably. These plants should receive no check whatever, and should be continued with a regular even growth right through the season. Another desideratum is that soils should be well drained, as plants of all descriptions thrive better in well-drained soils.

A sharp look-out should be kept on these plants for attacks of red spider. If this insect appears, a good spraying of tobacco solution or benzole emulsion should be given.

Constant watch will need to be kept for the various small caterpillars that attack the buds of these plants. Spraying with a weak solution of paris green and lime, or similar insecticide, will be useful. Hand-picking should also be resorted to.

REMINDERS FOR FEBRUARY.

LIVE STOCK.

Horses: *At grass.*—Supplement dry grass, if possible, with some greenstuff. Provide plenty of pure water and shade shelter. *In stable.*—Supplement hard feed with some greenstuff, carrots, or the like, and give a bran mash once a week at least. Avoid over-stimulating foods, such as maize and barley. Give hard feed in quantities only consistent with work to be performed. Stable should be well ventilated. and kept clean. When at work, give water at short intervals. Always water before feeding. Great benefit will result in supplying horses—more especially young ones running at grass—with a lick. The following one is recommended:—

Salt	20 parts
Lime	20 parts
Superphosphate	10 parts
Sulphate of iron	5 parts.

By having troughs constructed that will protect the lick from rain a considerable saving will be made.

Horses at grass require their feet attended to at frequent intervals, otherwise deformity of feet and lameness may result.

Cattle.—Provide succulent feed and plenty of clean water easy of access; also shade and salt lick in trough. Have each cow's milk weighed and tested for butter fat regularly. Rear heifer calves from those that show profitable results. Give milk at blood heat to calves. Keep utensils clean or diarrhœa will result. Do not give too much at a meal for the same reason. Give half-a-cup of limewater per calf per day in the milk. Let them have a good grass run or lucerne, or half-a-pound of crushed oats in a trough. Dehorn all dairy calves except those required for stud or show purposes. Keep bulls away from cows.

Pigs.—Sows about to farrow should be supplied with short bedding in well-ventilated styes. All pigs should be provided with shade and water to wallow in. There will be plenty of cheap feed available now, and there is a good margin between cost of feed and price for fat pigs. Read *Bulletin* No. 16, May, 1915. Pigs should be highly profitable animals to feed now.

Very coarse cross-bred ewes are usually not in season until this month. Where grazing sheep or ewes for future breeding and shearing are required, good fleeced merino rams, if procurable, should be used with these. Quality and quantity of fleece, as well as carcase, should be kept in view for several years to come. Should there be among the rams to be used any distinctly inferior to the others, keep them back for twenty-one days, giving the best rams the first three weeks, being sure the ewes are in season. Narrow, inferior rams are almost invariably active, rapid workers compared to sheep of more substance. Keep salt available. Drench any weaners scouring. If necessary to feed do not wait until in-lamb ewes are weak before commencing. When on continuous dry feed sheep move directly off camp to water towards evening each day before feeding. When water becomes inferior, or scarce, and available to in-lamb ewes irregularly, losses with both ewes and lambs before and after lambing appears to be more prevalent.

Avoid moving good woolled sheep unnecessarily in heat and dust of summer.

Poultry.—Chickens should now be trained to perch; they will be more healthy.

Provide plenty of green feed and give less grain and meat. Avoid condiments. Keep water in cool shady spot and renew three times each day. Keep dust bath damp.

Birds showing symptoms of leg weakness should be given 1 grain of quinine per day (three months old chickens, ½ grain) and plenty of milk.

CULTIVATION.

Farm.—See that haystacks are weatherproof. Cultivate stubble and fallow, and prepare land for winter fodder crops. Get tobacco sheds ready for crop. In districts where February rains are good, sow rye, barley, vetches, and oats for early winter feed.

Orchard.—Spray for codlin moth. Search out and destroy all larvæ. Cultivate the surface where necessary and irrigate where necessary, paying particular attention to young trees. Fumigate evergreen trees for scale. Continue budding.

Flower Garden.—Cultivate the surface and water thoroughly during hot weather. Summer-prune roses by thinning out the weak wood and cutting back lightly the strong shoots. Thin out and disbud dahlias and chrysanthemums. Layer carnations. Plant a few bulbs for early blooms. Sow seeds of perennial and hardy annual plants.

Vegetable Garden.—Continue to plant out seedlings from the seed-beds. Sow seeds of cabbage, lettuce, cauliflower, peas, turnip, and French beans. Keep all vacant plots well dug.

Vineyard.—February is the best month for the "Yema" or Summer bud graft (see article in *Journal* for January and February, 1917). Select scion-bearing vines; mark with oil paint those conspicuous for quality and quantity of fruit, regular setting and even maturity.

Sulphur again, if oidium is prevalent, but avoid applying sulphur to wine grapes too short a time before gathering.

Cellars.—Prepare all plant and casks for the coming vintage. An ounce of bisulphite of potash, or a couple of fluid ounces of bisulphite of soda solution, to each bucket of water used to swell press platforms, tubs, &c., will help to keep it sweet. Keep cellars as cool as possible. Complete all manipulations so as to avoid handling older wines during vintage.

MANGE IN DOGS.

Mange as commonly found in dogs is of two varieties, each due to the rapid growth in or on the skin of mange mites or acari. One variety which causes intense itching is known as sarcoptic mange. The symptoms are small red patches, extending, which the dog continuously rubs; they may be on any part of the body, but generally commence on the head and ears and lower line. The skin is red and inflamed, and has small papules and vesicles not unlike those of eczema. The hair falls off and the skin becomes thickened and grey and scurfy. The disease spreads quickly, and in a few weeks the whole body may be involved, the dog becomes poor and miserable. Treatment, says the Veterinary Lecturer (Mr. F. E. Place, B.V.Sc., M.R.C.V.S.) demands the destruction of all bedding and the disinfection of sleeping places, otherwise a cure is impossible. A soda bath should be given, and when dry half the body should be dressed with a mixture of flowers of sulphur 4 ozs., liquor potasse 2 ozs., oil of tar 2 ozs., and olive oil to a pint. In four days to a week he should have another soda bath, and the other half of the body should be dressed. A week later all the grease should be removed by another soda bath, and in most cases the dog will be cured.

The other form of mange is known as follicular, and occurs in two forms, pustular or squamous, *i.e.*, in mattery heads or scurfy scales. It generally begins round the eyes, and spreads to the face and forehead, it then appears on the feet and legs, especially inside the elbows, and gradually extends over the body. The first symptoms are patches of baldness, the skin is hot and purplish, with papules and pustules; as the patches increase in extent the skin thickens and puckers into folds, especially about the head, and there is a peculiar offensive smell, and the skin turns a slaty grey, cracks, and blood oozes, and often there is a dropsical swelling about the head. The dog seldom scratches, but shivers and shakes himself. For treatment a satisfactory dressing is a mixture of formalin 3 drams, glycerine 2 ozs., methylated spirit 2 ozs., oil of cloves 3 drams, olive oil 3 ozs., almond oil 3 ozs. This is applied daily, and there is a reddening and swelling of the skin; after a few dressings the pustules dry, become scaly, and disappear; the skin becomes soft and healthy. Sulphur ointment is then applied for a few times, and followed by a daily dressing of formalin ½ dram, glycerine 1 oz., tincture cantharides 1½ drams, salicylic acid ½ dram, methylated spirit 1 dram, almond oil 2 ozs., olive oil 6 ozs.

The hair begins to grow, and the worst case is cured.

The squamous or scaly type is more generally found in small pets than in farm dogs, and requires less drastic but more persistent treatment.—[*Journal of Agriculture*, South Australia, May, 1917.]

Government Herd of Red Polls

MILK RECORDS

The figures below refer to the cow's best lactation period. Details of each cow's yearly performance since the establishment of the herd are given in the Journal for February, 1917.

Each cow's averages for all lactation periods will be furnished on application to the Director of Agriculture.

COWS

NAMES.	Days in Milk.	Weeks in Milk.	Milk, in lbs.	Average Test.	Butter Fat (lbs.)	Commercial Butter (lbs.)	Price of Bull Calf.
Muria	365	52	14,972	5·9	885	1,008	43 Guineas
Birdseye ..	365	52	9,146	6·5	597	683	29 ,,
Netherlana ..	365	52	11,506	4·3	490	560	24 ,,
Vuelta	289	41¼	7,750	6·2	485	553	24 ,,
Persica	351	50	9,607	4·9	480	547	23 ,,
Cuba	337	48	10,464	4·5	478	545	23 ,,
Bullion	321	45¾	10,928	4·3	469	535	23 ,,
Virginia.. ..	344	49	10,252	4·4	457	520	22 ,,
Pennsylvania ..	348	49½	10,607	4·1	437	499	21 ,,
Sumatra ..	290	41½	9,232	4·6	431	492	21 ,,
Violet III. ..	365	52	9,172	4·7	427	488	21 ,,
Egypta	327	46¾	10,646	3·9	418	477	20 ,,
Phillipina ..	365	52	8,213	4·9	400	456	19 ,,
Mexicana ..	282	40¼	8,641	4·6	400	456	19 ,,
Lily	365	52	8,525	4·6	392	448	19 ,,
India	365	52	8,556	4·6	391	445	19 ,,
Europa	347	49½	8,765	4·4	387	441	19 ,,
Kentucky ..	338	48	9,893	3·9	382	435	19 ,,
Goldleaf ..	362	51½	8,415	4·4	378	431	18 ,,
Picotee	365	52	8,490	4·4	371	424	18 ,,
Primrose League (imp.)	365	52	8,060	4·4	353	403	35 ,,
La Reina ..	329	47	6,712	5·13	344	394	17 ,,
Pipio	334	47½	6,802	4·8	326	372	16 ,,
Mongolia ..	283	40	7,483	4·33	323	369	16 ,,
Turka	279	39¾	6,395	4·9	316	360	15 ,,
Britannia ..	329	47	7,637	3·9	301	343	15 ,,
Samorna ..	365	52	6,198	4·75	294	335	14 ,,
Asiana	279	39¾	5,933	4·9	292	333	14 ,,
Tennessee ..	311	44¼	6,706	4·2	283	322	14 ,,
Alpina	344	49	7,094	4·0	283	322	14 ,,
Sylvia	301	43	5,286	4·84	256	292	12 ,,
Hispana ..	365	52	6,574	3·6	242	276	12 ,,
Africana ..	303	43	5,082	4·72	240	274	12 ,,
Tasmania ..	325	46	5,112	4·52	231	264	11 ,,
Canada	275	39	4,918	4·07	200	228	10 ,,

HEIFERS (1st Milking completed, 1915-16)

Carribea ..	365	52	7,142	4·35	310	354	15 Guineas
Japana	357	51	7,788	3·63	283	322	14 ,,
Serbia	365	52	6,092	4·45	271	309	13 ,,
Itala	365	52	6,346	4·09	260	297	13 ,,
Oceana	365	52	6,247	4·11	256	292	12 ,,
Russia	365	52	6,413	3·96	254	290	12 ,,
Panama ..	288	41	5,997	4·23	254	290	12 ,,
Ontario ..	365	52	6,059	4·15	251	286	12 ,,
Soudana ..	346	49	5,486	4·54	249	284	12 ,,
Pacifica ..	365	52	4,979	4·88	243	278	12 ,,
Laurel	325	46	5,554	4·86	226	257	11 ,,
Barbery ..	359	51	5,387	3·72	200	228	10 ,,
Congo	296	42	4,449	4·21	187	213	10 ,,

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[Registered at the General Post Office, Melbourne, for transmission by Post as a Newspaper.]

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February, 1918.

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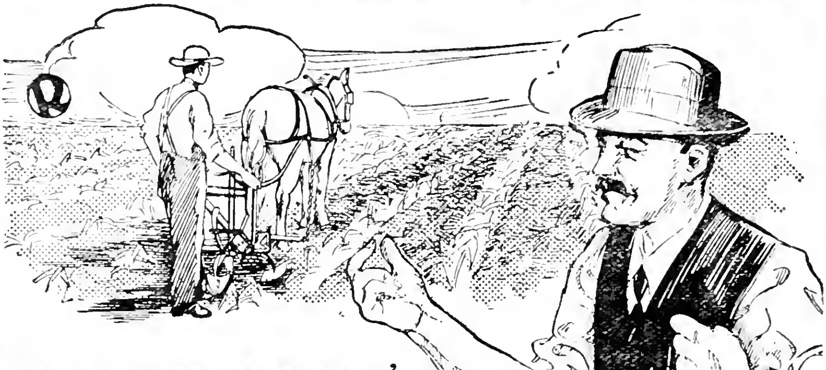

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THE JOURNAL

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The Department of Agriculture

OF

VICTORIA.

Vol. XVI. Part 2. 11th February, 1918.

NHILL AGRICULTURAL SOCIETY ANNUAL CROP AND FALLOW COMPETITIONS, 1917.

Report of Mr. H. A. Mullett, B. Ag. Sc.

I have much pleasure in forwarding my report on the Nhill Crop and Fallow Competitions for the year 1917.

I understand that this is the sixteenth competition that has been held under the auspices of your society, and I take the opportunity of congratulating the society on its singular achievement. To the value of the work, the very high standard of farming so widespread in your district bears eloquent testimony.

REVIEWING PAST CONDITIONS.

EARLY THOUGHT DIRECTED MAINLY TO MANURIAL AND CULTURAL PROBLEMS.

Being keenly impressed while in your district with the value of these competitions in promoting—

1. The best farming practices;
2. A healthy spirit of rivalry among farmers;
3. A rapid dissemination of the latest information available;
4. Publicity of special methods of the best farmers.

I have inquired into their history. From reports kindly placed at my disposal I have been able to peruse the remarks of the various judges who have officiated from time to time. These reports also contain certain figures, and, taken serially, a striking picture of advancement unfolds itself.

Every judge admitted that he had learned something from the best farmers of the district, and details of this knowledge were noted for all to read in his report. In addition, the adjudicators made suggestions from information gained in other districts, and generally made available details of advanced practices that had been determined by experimental work here or in other parts of the world to be of fundamental importance.

17260

Thus in 1900 Dr. Howell, when acting as judge for Mr. Trumble's prizes, urged the more extended use of the seed drill and also the widespread use of superphosphate. He recommended rotation farming, and laid emphasis on the value of sheep to the wheat farmer. In 1903 Mr. Lee stated that the annual manurial dressing in use was from 40 to 45 lbs. super. per acre, but that no farmer used more than 56 lbs., while some used as little as 28 lbs. He advocated increasing the dressing to 56 lbs., and pointed out the need for the better working of the fallow.

Mr. Knight advocated the sowing of rye grass and melilotus with the oat crop in order to produce a quick growth of feed on the stubbles, a practice which has spread far and wide from the few who used it in those days.

Later Attention Directed Towards the Seed as Well.

So far it will be noticed that all the attention had been directed to manurial and cultural problems, but Mr. Gamble in 1903 broke new ground by directing attention to the care of the seed—the use of pure graded pickled seed. He also advocatd provision for fodder crops for sheep on the fallows.

By 1911 great strides had been made, and our agricultural practices and the factors that underlie them had taken a very definite shape. Mr. Richardson, the judge on that occasion, focussed attention on the use of pedigree selected seed, and he clearly crystallized modern farming knowledge in five fundamental principles for success in the Wimmera. They are:—

1. Early fallowing.
2. Careful working of the fallow.
3. Liberal manuring.
4. Rotation of crops.
5. Use of select bred, graded and pickled seed.

Attention Directed to Methods for Inducing the Spread of these Practices.

"These principles," said Mr. Richardson in his report, "have been proved by actual test. What was needed was to put them into practice—to induce the many to do what the few had proved so profitable."

Later Mr. Temple Smith laid stress on these principles, and also suggested the increased use of sheep on farms, and the provision of fodder crops for them in the rotation. Again he directed attention to the utilizing of water in existing swamps and catchments for the growth of small areas of irrigated crops, and suggested the further exploitation of underground water for the same purpose.

All the judges have laid stress upon the necessity for the development of the æsthetic side of farm life.

Results—Rapid and Widespread Application of the Best Methods.

On every side, the visitor finds evidence of the use and the rapid spread of these practices, which the best farmers have discovered for themselves, or have been induced to adopt in order to comply with the society's rules, or which have been suggested to them by the various judges.

One is impressed with the splendid stretches of well worked fallows free from weeds and adequately mulched, fallows that stand second to

none in the State. Again, a visitor cannot fail to notice the great number of cool and convenient residences that have been erected, each with its flower and vegetable garden, and well provided with young shelter belts of trees. Efficient and commodious farm outbuildings are to be seen everywhere.

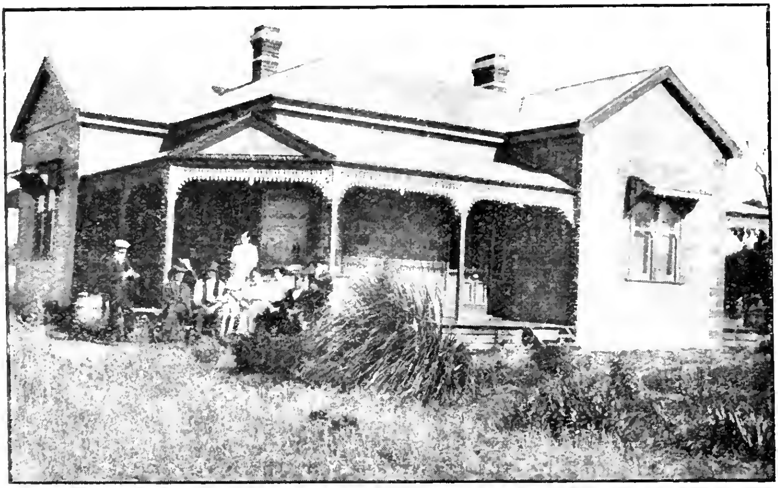
The Æsthetic Side of Farm Life. A Farmer's Up-to-date Home near Nhill.

Type of Farmer's Home and Garden that is becoming popular in the Nhill District.

The necessity for good water supplies as well as for fodder reserves has received attention from most of the farmers.

Turning to the manurial question, inquiry shows that the average manurial dressing is now about 56 lbs., but that the best farmers are

using up to 70 and 80 lbs. on the black ground, and as much as 1 cwt. on red ground. In this connexion it will be noticed that the dressings advocated are heavier than those recommended fifteen years ago; but it should be remembered that many crops have been taken off the ground since then and that efficient working of the fallows has rendered greater

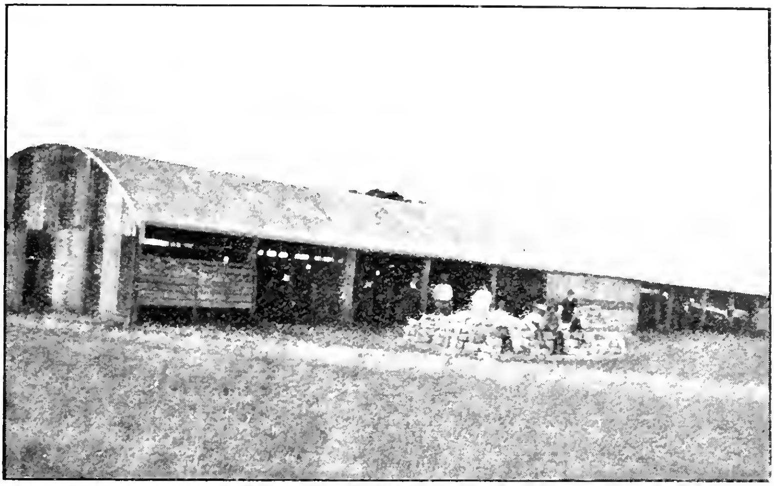


Another Farm House.

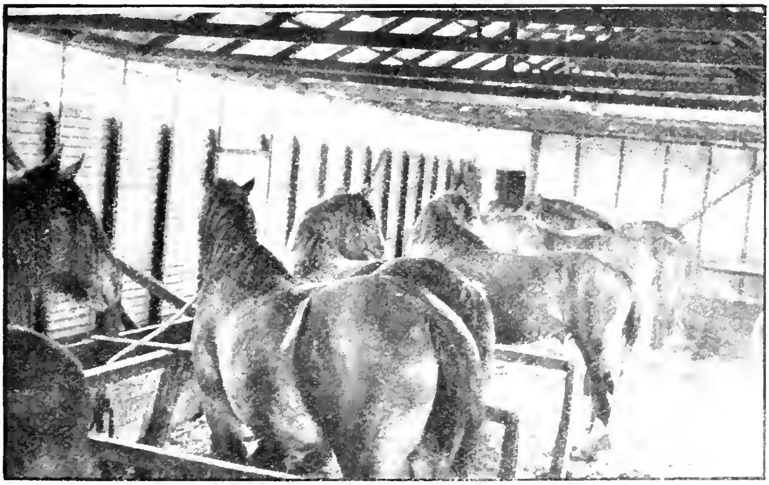
Labour Saving Device—An Elevator being used to build stack of loose hay.

crops possible by storing up supplies of water and by making available greater supplies of plant food. Phosphorus is the most deficient element in Wimmera soils, and a 30-bushel crop will take out as much phosphorus as is contained in 1 cwt. of superphosphate.

Furthermore, the experimental plots at Longerenong have demonstrated that on the black soil the use of 1 cwt. of superphosphate has been most profitable for the past five years.



A Twenty-horse Stable being erected by Mr. R. Blackwood, Kiata East. Dome type, cheap, airy, storm-proof and convenient. Pitched with Stawell stone.



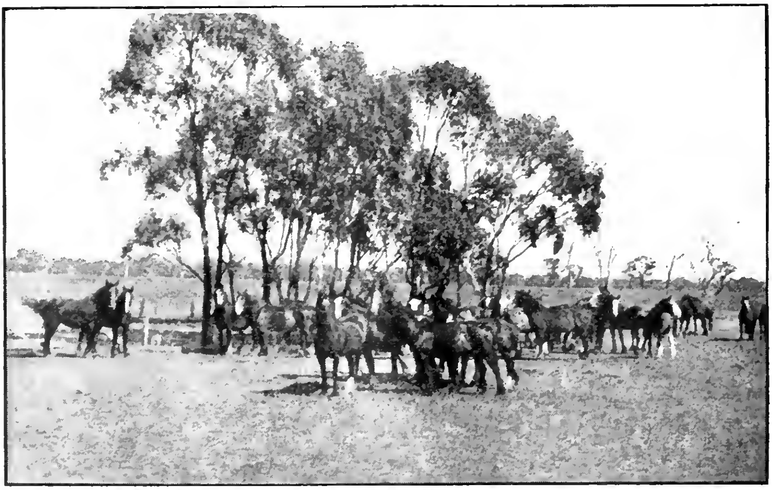
Interior of Mr. Geo. Crouch's Stable, showing good stamp of working horses.

Well-headed crops pure and true to type, with a fine table-top appearance, proved to be almost invariably grown from pedigree seed of such prolific varieties as Federation, Yandilla King, Penny, Dart's

Imperial, &c., showing that care and attention to seed was not being neglected.

The rotation—fallow, wheat, oats and grass for sheep—appears to be general, and where it has been faithfully carried out, the take-all disease has been suppressed. The only places where take-all was noticed this year were on very large farms on which land had been sown out to grass for a number of years, and no oat crop grown between the successive wheat crops, even though several years had elapsed between the two crops.

Owing to the slowness with which grasses tend to establish themselves on the stubbles in the Wimmera, the wild oat, which does so readily, finds many advocates, but all admit that it causes serious loss to the succeeding wheat crop and would welcome a substitute. In this connexion the attention of Nhill farmers is directed to a series of permanent rotation plots which were established last year at Longerenong College. They comprise tests between ten different systems of farming, including the



A Group of Working Draught Horses at Nhill in splendid condition.

Wimmera rotation and rotations in which peas, rape or barley figure. These experiments will be continued from year to year, and the results over a series of years should throw considerable light on the question as to whether forage crops for sheep can be successfully and profitably grown in the Wimmera.

Many other instances might be given to illustrate the spirit of progress in the Nhill district. Perhaps the best is that shown in the following table prepared from the estimated yields in the competition "Best Half of Farmers' Wheat Crop (not less than 75 acres)," submitted by the various judges. The figures, which I give with some diffidence, as they are merely the judge's estimates, and it may be argued that they represent the increasing optimism of the later-day judges, show a steady increase in yield over the whole period.

The average estimated yield for the five years 1903-7 was 18 bushels, while the average estimated yield for the five years 1912-17, not including the drought year (1914), was 28 bushels, which is double the district

average for a like period. I give these figures for what they are worth, but am satisfied that they afford silent testimony of the comparative efficiency of your modern agricultural practices, and show a meritorious exhibition of solid progress.

DETAILS:

Year.	Highest Yield.	Lowest Yield.	Average.
1903	19 bushels	12 bushels	16¾ bushels
1904	20 ,,	10 ,,	16 ,,
1905	24 ,,	16 ,,	20 ,,
1906	23 ,,	14 ,,	20 ,,
1907	24 ,,	16 ,,	19½ ,,
1908	26 ,,	18 ,,	21½ ,,
1909	Not available.		
1910	38 bushels	18 bushels	29 bushels
1911	35 ,,	21 ,,	24½ ,,
1912	36 ,,	18 ,,	24½ ,,
1913	36 ,,	22 ,,	29½ ,,
1914	Drought—no competition.		
1915	34 bushels	24 bushels	30 bushels
1916	34 ,,	26 ,,	29 ,,
1917	37 ,,	27 ,,	27½ ,,

NOTE.—It is interesting to note that in the drought year of 1914 the average yield of Lowan was higher than that of either Borung or Kara Kara.

THIS YEAR'S COMPETITION.

RESULTS.

Turning now to the competition itself, I would like first of all to congratulate the whole of the competitors on the splendid crops and fallow shown. Excessive wet has placed some in an unfavorable position, and they are to be commended for the public-spirited action in entering under these conditions.

In Section 1—" Best Exhibited Half of Farmers' Wheat Crop " (not less than 75 acres), I have placed the competitors in the following order:—

1st.	Mr. Robert Blackwood, Kiata East	94
2nd.	Mr. C. H. Roediger, Lorquon	93
3rd.	Mr. John Collins, Woorak	92

The results were generally in favour of summer fallow, heavy dressings of superphosphate and the use of select-bred pedigree seed.

Mr. Blackwood showed some exceedingly heavy crop, comprising Currawa, Penny and Federation. The whole crop was very level, true to type and free from disease, but there were wild oats present. On the day of judging, the Currawa, though very heavy, showed no tendency to go down; but I was sorry to notice, when passing four days later, that portion of the crop at least was likely to go down. However, as the judging must be made on the appearance on the day, Mr. Blackwood lost no additional marks.

The crop was sown with 60 lbs. of seed and 60 lbs. of manure on black ground, and 80 lbs. on red ground. It was sown the first week in June on summer fallow after oats; the pickling was with bluestone.

Mr. Roediger comes a good second with a splendid crop of Penny and Yandilla King. This crop was not as heavy as Mr. Blackwood's, but it was absolutely free from wild oats, and had a remarkably level table-top

Portion of Mr. Robert Blackwood's first prize crop—Currawa and Penny.

Portion of Mr. C. H. Roediger's second prize crop—Yandilla King and Penny.

appearance. It was well headed, and true to type, but there was a little take-all present. It was a really desirable crop, just the right height, but Mr. Blackwood's much heavier yield and freedom from disease won him the day.

Mr. Roediger's crop was sown this year deeper than usual, with 80 lbs. of seed, on account of mice. Generally he sows 50 to 60 lbs. of seed. The manure was from 60 to 65 lbs. The crop was sown in winter fallow, and the seed was pickled in bluestone, 1 to 8 gallons strength, in a definite manner.

Mr. Collins showed a very heavy and creditable crop of Federation, which was grown on summer fallow, using 63 lbs. seed and a similar quantity of manure. The crop was eaten off by sheep, and there were twelve cultural operations involved in working the fallow.

A young farmer, Mr. Thiele, of North Yanak, showed a clean, level crop of Federation, free from wild oats, and true to type. Mr. Thiele is living on a property upon which several other families failed to make a living, and his crop merits a good deal of praise.

Mr. Pargeter, Woorak West (summer fallow and 70 lbs. manure); Mr. S. C. H. Treloar, Lorquon (summer fallow and 50 lbs. manure); Mr. Goodwin, Kaniva, are all young farmers who showed creditable crops, and men who promise to figure prominently in future competitions.

The following are the details for—

Section I.

Name and Locality.	Variety.	Freedom from Weeds.	Freedom from Disease.	Purity and Trueness to Type.	Evenness of Crop.	Apparent Yield.	Total.
Possible Points ..	.. .. ..	**15**	**15**	**20**	**15**	**35**	**100**
Robert Blackwood, Kiata East	Penny .. Currawa Federation	12	15	19	13	35	94
C. R. Roediger, Lorquon ..	Penny .. Yandilla King	15	14	20	15	29	93
John Collins, Woorak ..	Federation ..	12	15	19	13	33	92
E. H. Thiele, North Yanak	Federation ..	14	14	20	15	26	89
R. L. Pargeter, Woorak West	Federation ..	11	14	17	12	28	82
A. W. Goodwin, Kaniva ..	Federation ..	12	14	17	11	25	79
Geo. Crouch, Kaniva ..	Federation ..	13	12	19	12	26	82
C. F. H. Riechelt, Woorak West	Penny .. Federation Golden King	11	14	17	12	26	80
S. C. H. Treloar, Lorquon	Federation ..	11	14	16	13	26	80
David Duthie, Lorquon ..	Lots and Federation	12	13	17	12	26	80
W. H. Treloar and E. F. Schultz, Lorquon	Lots and Federation	11	10	16	11	25	73

Note.—The marks allotted for yield do not represent bushels, but are proportional to them.

Mr. J. B. Marshall, Lorquon, easily wins the Mallee section with 100 acres of Penny, grown from pedigree seed. This was a remarkably good crop for Mallee land, and should yield close on nine bags to the acre. It was clean, well headed, and true to type, but a little take-all

was present. This crop was sown in fallow land that had been out on grass for two years; 60 lbs. of seed was used, which is 10 lbs. heavier than usual; manure 50 lbs. After ploughing, the fallow was scarified twice, and harrowed twice.

Mr. McKenzie's crop was not up to his usual high standard. At Mr. Thiele's place, an interesting example of the comparative prolificacy of barley and wheat on Mallee land was noted. Federation wheat and Cape barley had been sown on fallow; from the Federation, between five and six bags per acre will be harvested, but fifteen bags per acre were being stripped from the barley.

Section II.—Mallee Crop—Best 100 Acres.

Name and Locality.	Variety.	Freedom from Weeds.	Freedom from Disease.	Purity and Trueness to Type.	Evenness of Crop.	Apparent Yield.	Total.
Possible Points ..	.. .. ..	15	15	20	15	35	100
J. B. Marshall, Lorquon ..	Penny ..	14	14	20	14	26	88
G. R. McKenzie, Glenlee ..	Federation ..	11	12	17	13	21	74
E. H. Thiele, Yanac North	Federation ..	12	12	19	12	17	72

In Section 3—Best Fallowed Land, not less than 100 Acres—I have placed Mr. John Collins first, with 96 points; C. F. H. Reichelt second, with 95; and Robert Blackwood third, 94. All these competitors showed magnificent fallows, liberally mulched, free from weeds, and showing a firm, consolidated seed-bed underneath, containing a high percentage of moisture. Summer fallows in every case showed the highest moisture content.

Mr. Collins showed 94 acres summer fallow, and 115 acres winter fallow. The winter fallow had been disced after wheat, and subsequently received two discings and two other cultivations.

Mr. Reichelt's fallow had been worked eleven times, but the mulch was rather shallow.

Mr. Blackwood showed 160 acres summer fallow that had been ploughed to 5 inches after oats. At the end of June it was run over with a skim plough without a mould-board to germinate the weeds. It was then harrowed after each rain. Mr. Blackwood lost points for rather uneven cultivation on the loamy patched.

Of the remaining competitors, many whose farms are in crab-holey country, were unable to work their land as much as usual. A few fallows lacked moisture though the fallow presented a good appearance, suggesting that the mulch had not been maintained, or had been only recently applied.

Mr. Harvey Warner showed a piece of fallow, part of which had been ploughed, and part scarified; the resulting crop will be interesting to watch.

Section III.—Best Fallowed Land—Not Less Than 100 Acres.

All Fallow to be Shown.

Name and Locality.	Soil—Type.	Moisture.	Mulch.	Cultivation.	Freedom from Weeds.	Total.
Possible Points ..	.. ..	25	25	25	25	100
J. Collins, Woorak ..	Grey black loam, sandy loam patches on rises	24	25	23	24	96
C. F. H. Riechelt, Woorak West	Grey black clay loam, red clay patches	24	23	24	24	95
R. Blackwood, Kiata East ..	Black clay loam, red clay patches	23	25	22	24	94
H. Warner, Winiam ..	Grey black loam, red loamy rises, clay patches	22	25	21	25	93
C. Crouch, Kaniva ..	Black clay loam, red patches	24	21	22	24	91
D. Duthie, Lorquon ..	Red loam, rising to grey black loam on hill	21	22	23	25	91
A. V. Goodwin, Kaniva ..	Black clay loam, red clay patches	21	21	23	24	89
R. F. Keller	Grey black clay loam, red patches	19	24	22	22	87

Section IV.—Best Wheat Crop Grown on Fallow Land.

(Fallow judged 1917. Crop judged 1918.)

Most of the competitors in this section exhibited in No. 3, Mr. H. Crouch, Kaniva, being the only exception.

Name and Locality.	Soil—Type.	Moisture.	Mulch.	Cultivation.	Freedom from Weeds.	Total.
Possible Points ..	.. ..	25	25	25	25	100
J. Collins, Woorak ..	As in Section 3	24	25	23	24	96
C. Reichelt, Woorak West ..	,, ,, ...	24	23	24	24	95
R. Blackwood, Kiata East ..	,, ,, ...	23	25	22	24	94
C. Crouch, Kaniva ..	,, ,, ...	24	21	22	24	91
D. Duthie, Lorquon ..	,, ,, ...	21	22	23	25	91
H. Crouch, Kaniva ..	Very even paddock, black clay loam	24	20	23	21	87
R. F. Keller, Lorquon ..	As in Section 3	19	24	22	22	87

Note.—Owing to excessive wet a heavy growth of grass made its appearance on Mr. H. Crouch's fallow. This was being fed off with sheep at the time of judging. Although there was little mulch and there was still grass in the paddock, there was abundant moisture, but it showed evidence of drying out and needs working after the first shower.

In connexion with the fallows, great difference is necessary in the treatment of red and black land. Those farming black soil are in a very favorable position, as they can work their land at any time, and this has led to owners of red land refraining from competing. It has been suggested that a separate competition be held exclusively for farmers having red soil, and this appears to be a good idea, as it should result in the solution of the problem of working this soil to the best advantage.

Summing Up.

This year's crop competition throws into strong relief the advantage of summer fallowing, even in a wet season; and, further, it confirms the value of the dressings of superphosphate, which are higher than the district average. A glance at the marks allotted for yield shows very clearly that three out of the four best crops were grown on summer fallowed land, and that on each of these four crops from 60 to 70 lbs.

Farm Competition Trophies won by Mr. Geo. Crouch, showing a long line of successes—the result of thorough and up-to-date methods.

superphosphate was used. It is very probable that even heavier dressings will prove payable on land that is thoroughly well worked if sown with prolific stiff-strawed varieties.

Suggestions: The Labour Question.

It would appear that under the present economic conditions, the factors for success are well known in the Nhill district. The great task is to induce everybody to adopt them. Two agents which help a very great deal in this work are the press and the competitions. As the years roll by, and the farms become smaller in area owing to subdivision, it will be more imperative to obtain higher returns per acre. When this state obtains, as pointed out in previous years, rotations which include growth of forage crops for sheep must play an important part; but there is one field that has not, so far as I know,

been exploited in the Nhill district, and it is one which is prominently before us at the present time: I refer to the most efficient use of the labour available. Agriculturists are faced with a serious labour shortage—a shortage which is not likely to be alleviated for a considerable time to come. Many of the principles that are so essential for success in wheat-farming, and which have been advocated as improvements on existing conditions, need extra labour for their accomplishment, and already farmers on every side find great difficulty in maintaining their usual area under crop. Some who have large areas are turning their attention to sheep-farming, but those who have smaller areas cannot increase their present flocks without the growth of forage crops—a work which also demands additional labour.

The farming community is therefore faced with the necessity of either reducing its wheat area, or lowering the quality of its work, and therefore its income, or else of utilizing available labour to better advantage: Is there any practical way of doing this?

The man on the land used to managing labour is naturally rather sceptical regarding any real improvement under present conditions; but if he is looking for a panacea that will solve every labour problem, he will be certainly disappointed. However, by a careful study of his particular labour problem, and the application to it of certain general scientific principles that have been found to be universally true, he can do much to relieve the present shortage of labour and materially augment his bank balance.

Nhill farmers have learned to value the basic scientific wheat cultural truths which form the ideal toward which efforts may be directed, and which are modified by the farmer according to his particular conditions; but the equally important, equally valuable, scientific labour truths, which at the present time are but vaguely understood, when formulated in clear, crystal form, will be equally as helpful.

There is nothing wonderful or startling in the application of science to labour in this way. Advantage is taken of the fact that in the performance of any piece of work consisting of a number of subsidiary operations, waste of effort is very apt to occur. This has been demonstrated by careful investigation of a large number of cases.

The principles that have been evolved from that investigation are merely designed to discover the waste and eliminate it, and attempts have been made to group many apparently different labour faults under a common head, rendering them easier to detect and easier to eliminate

These principles were first worked out in America, and applied with success to large industries there, and now form an integral part of the factory routine of the huge munition plants in Great Britain, and America as well. Their value in the economic utilization of labour has been immeasurable. It remains to review these principles and to see if they are of any practical value in wheat-farming.

The first basic principle is to search out the slowest operation of any series and to speed it up.

For example: If in the operation of chaff-cutting, there are five men on a cutter, and the pitcher is the slowest man, then the slowness not only affects the pitcher, but affects the whole five, and the valuable plant as well—the original fault becomes multiplied at least five times.

Again, take the operation of harvesting with the combined harvester: The driver is not careful to take a full cut; the fault of the driver is affecting the horses, the harvester, the bag-sewers, and perhaps the waggoner carting in. Or suppose one of the horses is a slow-coach, then that one slow horse affects the pace of the whole team, the driver, the harvester, the bag-sewers, the carters, and so on.

These examples are typical of many, and the farmer, if he is to save labour, must always be on the alert for that "lazy pitcher," whether it be man, horse, machine, or management, and then speed "him" up. Careful thought will convince most that in the hurry and bustle of seeding and harvest, much of the profit is apt to slip through our fingers in this manner; but a thorough grip of these principles enables any one to recognise instantly this fault and its consequences, instead of having but a worried, hazy idea of what is wrong.

It is often difficult to arrive at what is a fair day's work for man, machine, and horses under varying conditions—to know exactly what ought to be accomplished when an operation is performed in the right way. This can be done only by the keeping of accurate records, and this is the second basic principle.

But it will be argued that the difficulty is not to know what to do, but to induce the hired labour to do it, even allowing that no extra effort is required from the workman; and this is where the third great principle comes to the rescue and says that for part of the extra work performed, either by extra effort or by extra attention to a saving of effort, a reward must be paid. In this connexion, it might be found that it would pay farmers to offer efficiency reward to the workmen, say in the shape of a small area of crop, which should be part of, and be treated in exactly the same way as, the bulk area, the stipulation being that the farmer is to select a fair sample of the paddock (for the reward) after the crop has been sown, which would insure the whole field being properly worked.

This is a principle which might be capable of judicious extension if rightly applied.

Among the ways that readily occur to one by which a saving of time and labour is often to be effected are the following:—

1. The use of a maximum amount of horse strength and up-to-date implements of the largest size consistent with conditions. The more extended use of labour-saving devices, such as stack elevators, bag-lifters, pickling machines, &c. The more extended use of the internal combustion engine.
2. Provision of a reasonable supply of duplicates, and the overhaul of implements before the season starts.
3. Prevention of too great an overlap of cultural implements such as spring tooth harrows, &c., by straight driving. Attention to driving of harvester and binder with full width of cut.
4. Avoiding a waste of time through too much turning of implements on headlands, or, say, carting of bags on harvester to a grain dump which is situated too far away.
5. Provision of an adequate supply of chaff. Serious loss often occurs when press of work is heaviest if all hands have to cease work every fortnight to cut chaff.

6. Care and attention of working horses. The use and breeding of horses with satisfactory pace. The making up of teams so that slow horses do not become a drag on the rest. Attention to the feeding of horses, although, judging by the appearance of those in the Nhill district, farmers there have little to learn in this direction.
7. The stimulation of a healthy spirit of rivalry and competition among the various workers in the field.

The excuse for mentioning these well-known faults is to focus attention upon them, for in the press of work all these, and a thousand-and-one others are apt to be overlooked. Each in itself is perhaps small, but the cumulative effect of the many is considerable. Keen attention to them all will enable available labour to be utilized to a surprisingly better advantage, and thus cause a saving of many pounds to the farmers.

The whole question of the profitable utilization of labour on farms in Australia opens up a new and fruitful field for research. For instance, a collection of work records would be invaluable, not only to districts like Nhill, but also to the rest of the wheat belt of Australia. The presence of representatives of the local and the metropolitan weekly press during the judging will lead to wide publicity of the results, which, no doubt, will stimulate the interest of farmers in the district who did not compete as well as many others throughout the State.

I have to thank the various farmers for their generous hospitality tendered to me, and the ready way in which they volunteered information, which was often of great value, and I take this opportunity of paying a tribute to the zeal of your untiring secretary, Mr. Chas. Towns, whose efficient arrangements greatly facilitated the work of judging.

HEAT APOPLEXY IN PIGS is generally met with in sultry or hot weather, when the atmosphere is heavy or when housing conditions are not airy enough. It is caused by insufficiency of oxygen, and usually occurs with overfat pigs. Such an animal has very little room for lung expansion: and there is only a small amount of ozone in the air during thundery weather, so that sufficient oxygen does not enter the lungs to purify the blood, and suffocation occurs. Drenching with cold water, and shelter from the sun's rays, while allowing free exposure to the air, is the best method to pursue when an attack occurs. Prevention is better, however, and giving access to pasture where there is shade and shelter and water will usually keep the pigs healthy in summer time. The diet has a good deal to do with maintaining healthy pigs in summer. The food should not be a thick, solid mass, as in winter; but should be thinned down with whey, skim-milk, or kitchen slops. Care should be taken that all food is sweet and sound.—*The Australasian.*

APPLE CULTURE IN VICTORIA.

(Continued from page 24.)

By J. Farrell, Orchard Supervisor.

Management of Orchard Soils.

The amount of cultivation required by orchard lands in order that the highest returns may be obtained from these areas varies according to the class of soil and climatic conditions prevailing in the different localities. Generally speaking, two ploughings per year are sufficient to keep most of our orchard soils adequately loose to permit of their being maintained in a satisfactory condition of tilth by the employment of cultivators or harrows during the periods of growth. One ploughing 6 or 8 inches deep, according to the quantity of surface soil, should be given as soon as the first autumn rains have rendered the ground sufficiently damp to enable the work to be satisfactorily executed. On this occasion the soil is drawn towards the trees on both sides so that the furrows formed between the rows and running with the fall of the land may act as channels to carry away the surface water during the following winter. The soil should not be then further broken up, but allowed to remain in its rough fallowed condition and thus facilitate its pulverization, &c., through the various winter weather conditions and influences. When with the coming of the spring this desirable structural alteration of the soil has been achieved and the land assumes an early, dry, and friable condition, due mostly to the perfect working of the surface water channels, supplemented where necessary by a thorough system of sub-drainage, spring cultivation may commence. If friable surface conditions exist the land may be ploughed and cultivated, but when the surface is of a rough, hard, or tenacious nature and likely to turn over in lumps it should be worked with disc cultivators or harrowed before being subjected to the spring ploughing. The main object of this operation is to draw the soil away from the trees, and thus create a level surface like that which existed prior to the autumn ploughing. If the soil be of a tenacious character, the depth to which it is ploughed should be slightly altered at each ploughing to prevent the formation of a hard pan beneath the cultivated portion.

Plate 147 illustrates two orchard ploughs of the type mostly employed by our fruit-growers. Fig. 1 shows a single furrow plough suitable for small orchards. The shifting principle of the handles and the adjustable head-rack make it possible to plough the ground right up to the butts of the trees, when ploughing either on or off. Fig. 2, the double-furrow implement, is used in the larger orchard, and it also is fitted with shifting handles and head-rack which enable it to plough fairly close up to the trees, but the single-furrow is generally used to complete this work. Three-furrow ploughs constructed on the same principle are also obtainable. By the employment of these implements the orchardist is saved the extra expense of hand cultivating the strips around the trees.

If the orchard be situated in a dry, warm locality, and particularly if the soil be of a porous nature and liable to part freely with its moisture on being ploughed, no time should be lost in bringing the surface to a perfect state of tilth. A fine earth mulch, which prevents the escape of the soil moisture through capillarity, is thus provided. This

desirable rendering down of the surface may be achieved by the employment of a spring-tooth harrow or disc cultivator according to the nature of the soil. The one horse, nine tine, spring-tooth cultivator illustrated in Plate 148 is the type in most general use in the small orchards. It is shown in the illustration as running on the skid, but by the handle and rack adjustments the teeth may be lowered to work at the desired depth. This cultivator may be made to follow a straight course by lowering the circular blades a few inches into the soil. Then by regulating the pull on the draw chains the harrow will cultivate the soil close up to the trees. Larger cultivators of this type are employed in orchards of more extensive areas.

If the soil be hard and tenacious, and consequently not amenable to working with the spring-tooth harrow, the ordinary disc cultivator is employed to reduce the surface some distance from the trees to the required state of tilth. To meet the contingency of working the

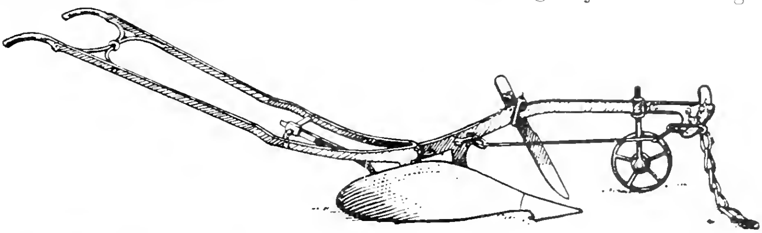


Fig. 1.

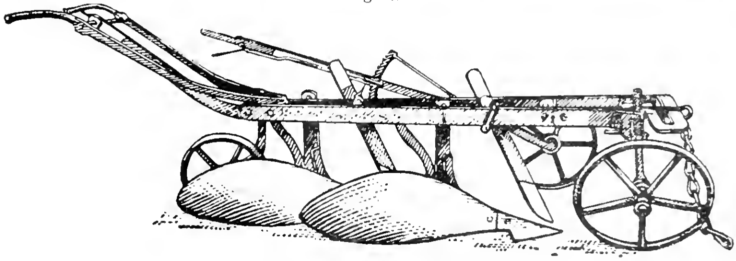


Fig. 2.

Plate 147—

Fig. 1. Single Furrow Orchard Plough of modern type.
Fig. 2. Double Furrow Plough constructed on similar principle to that shown in Fig. 1.

portion between and around the trees, however, the one-way extension disc cultivator shown in Plate 149 is brought into use. This cultivator is so constructed that the section of dished discs on the right cultivates the soil right up to the trees, when set as shown, and to plough off, it is only necessary to reverse the section by means of the adjustment. The horse travels in line with the driver's seat on the extreme left, and both are out of the way of limbs. The section of circular discs, without dish, under the driver's seat enters the ground and counteracts all the side thrust.

Fruit trees often suffer considerable damage by having their branches broken and portions of the bark of their stems removed by the old-fashioned swingle tree and long trace chains still used in some orchards. Particularly is this so when the work of cultivation is being performed by incompetent or careless drivers. The chance of injury to the trees may be reduced to a minimum by employing orchard harness of the

type shown in Plate 150. This harness is comparatively light, and the steel tube forming the bow is held up by the hip straps, and the traces being of leather, there is no rough surface to come into contact with the trees. As the draught is adjustable from straight behind the horse, when ploughing on or off, there is no liability of the bow chafing the horse's legs.

The almost continuous and necessary alteration in the physical formation of the surface of our orchard soils by ploughing and general cultivation is carried on partly for the suppression of weeds. One of the primary objects of cultivation, however, is to aerate the soil by

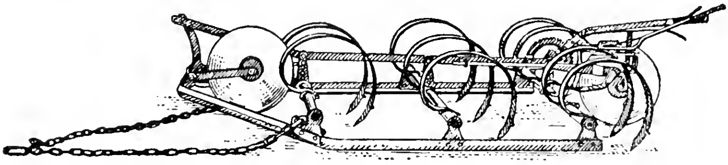


Plate 148.—One-horse Spring Tooth Cultivator.

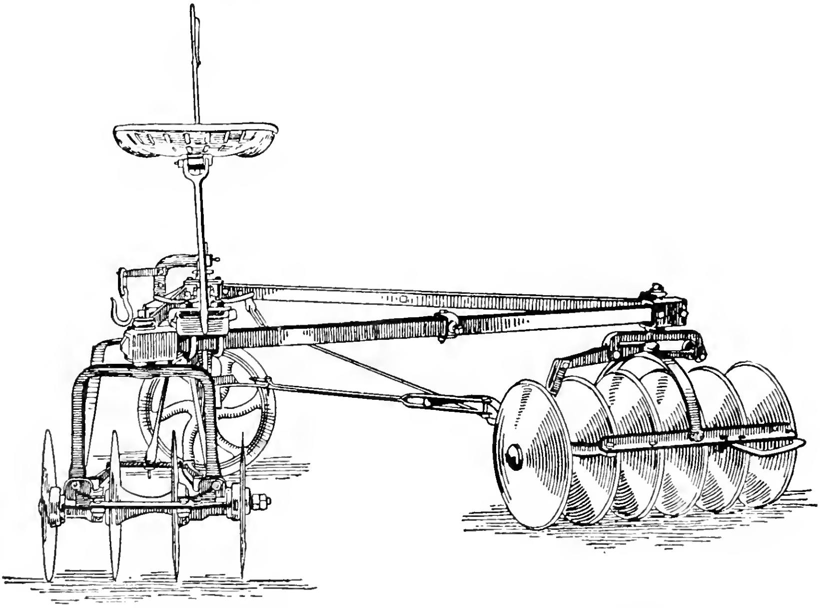


Plate 149.—The One-way Extension Disc Cultivator.

dividing up its particles, and thus encouraging bacterial activity, a change so desirable in heavy, sour soils. A reason of no less importance is to maintain the surface mulch by means of which the soil moisture is conserved so that it may be available for the trees during dry weather.

A third or cross ploughing is often given, where the surface soil is of a nature that becomes hard and closely packed after rain or irrigation, to maintain a state of intense cultivation; but, when practised, this work should be carried out at a time when surface drainage would not be interfered with. In the vast majority of orchards, however, the cross-ploughing may practically be obviated by occasionally cross or diagonally

working the land with the cultivators, when in a fit condition, after rain or irrigation. By the use of a heavy roller, the lumps that often appear on the surface of this class of soil, after the spring tooth cultivators especially, may be reduced to fine earth, which helps to conserve the soil moisture, and the plant food which the lumps contain is made available to the feeding roots of the trees.

In the British Isles and other cool climates, apples are fairly successfully grown without soil cultivation, but absolute failure has invariably attended any attempts made here to emulate methods of the Old Country in this regard. The orchard soils there being fairly deep and rich, generally afford free drainage. They retain their moisture well during summer, and are considerably benefited by being annually pulverized to a considerable depth by the action of severe winter frosts. Whereas, to obtain the equivalent and necessary physical alterations of the soil so essential to the growth of trees in this country, we are obliged to resort to intensive cultural operations.

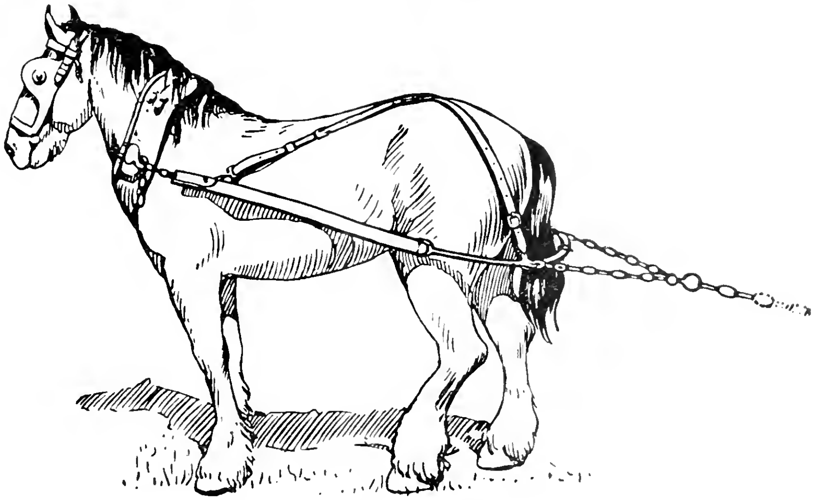


Plate 150.—Modern Orchard Harness.

CROPPING AMONGST THE TREES.

It is safe to state that by far the higher percentage of the areas under apple culture in the various centres of the State has been established on virgin soils. It is generally recognised that these soils, to whatever individual classes they may belong, contain higher percentages of the original elements essential to the growth of the trees, and to the regular and plentiful production of fruit during a long series of years, than to soils which have been depleted of those elements mainly through the production of cereal crops.

Although much information regarding the undesirable practice of growing cereals among fruit trees has, for many years, been disseminated by the experts, yet, inspection sometimes reveals orchardists who still pursue the practice.

Plate 151 illustrates a crop of oats growing among four-year-old Emperor Alexander trees. Since it is unquestionably desirable to plant on virgin soil, as was the case in the orchard illustrated, it is obvious that to grow subsequently a fodder crop, oats particularly, among the trees

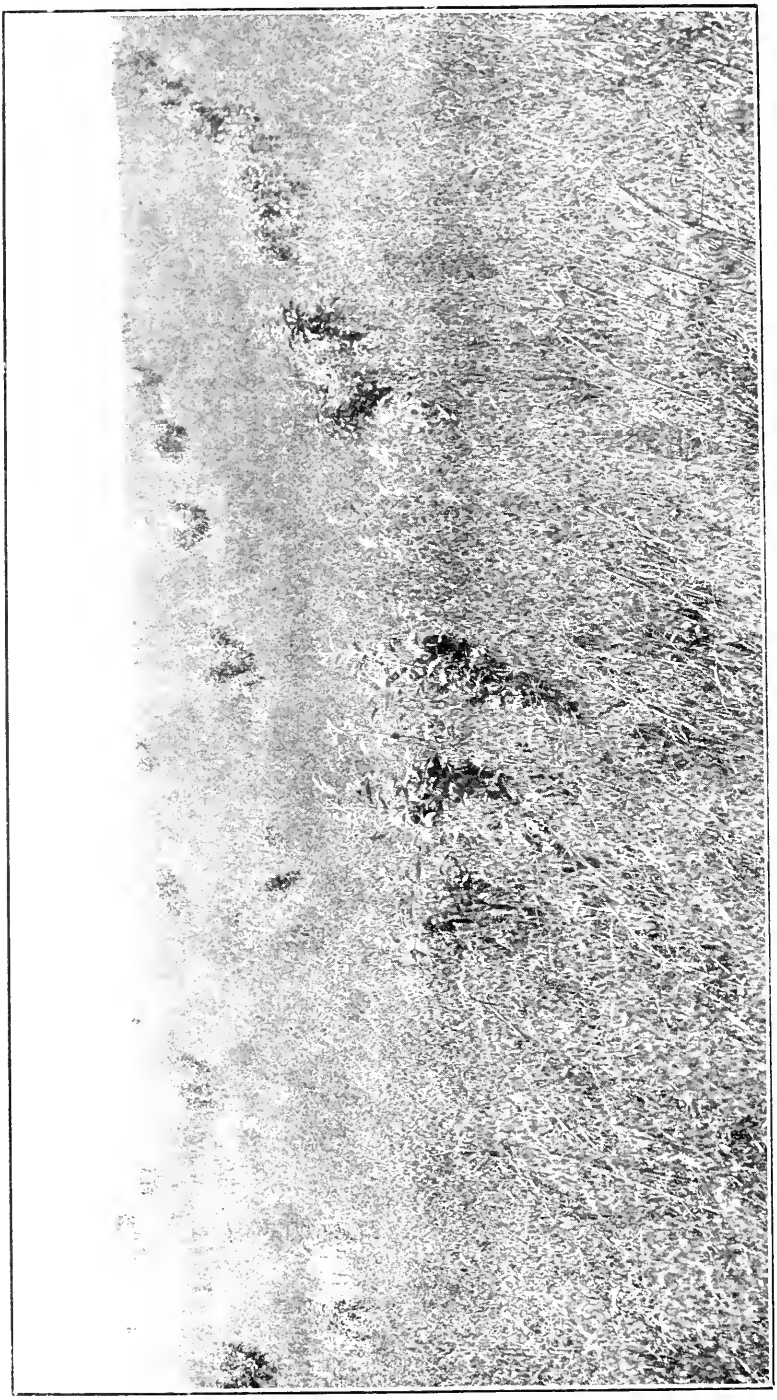


Plate 151.—A Crop of Oats growing among four-year-old Emperor Alexander trees.

Plate 152.—A Block of King David Trees, four years old, growing under a system of clean cultivation.

is a practice that merits the most severe condemnation. Even though strips including the whole of the young trees' root feeding areas be reserved, and the fodded crops be sown on the areas between them, the practice must still be condemned, for, as the crop grows, it partly excludes the light and air from the lower limbs and foliage of the trees. When their root pasturage extends to the cropped areas, the trees commence to show a lack of vigour, and later the light yields of fruit of poor colour usually demonstrate the undesirableness of cropping orchard land.

Fruit-growers with limited capital commencing on small areas are often compelled, through force of circumstances, to seek returns by cultivating peas, beans, strawberries, &c., between the rows until the trees come into bearing. Owing to the amount of manure and extra working necessary for the profitable production of these crops, their cultivation between the rows is an advantage rather than a detriment to the trees.

Compare the conditions under which the trees are growing in the orchard depicted in the illustration under review with the block of King David trees of the same age, growing under a system of clean cultivation as shown in Plate 152. From a study of these illustrations the reader cannot fail to realize that further comment in this connexion is unnecessary, and that no orchardist regarding the growth and fruiting prospects of his trees as a matter of paramount importance, would grow crops of hay among them.

Manuring the Orchard.

The value of orchard land from the fruit-growers stand-point may be said to be rich or poor largely on account of the available elements of the essential plant foods contained in it. At the same time the fertility of the land also depends on the mechanical condition and structure of the soil itself. Usually virgin soils suitable for apple culture contain, in the necessary proportion, the three elements of plant food, viz., nitrogen, phosphoric acid, and potash, which are required for the healthy development of the trees, and the production of remunerative crops of fruit. When it is found by chemical analysis or manurial experiment that the supply of these ingredients has become gradually exhausted by continuous cropping, it should be replenished by the application of suitable manures and fertilizers to the soil.

Organic Manures.

Owing to the marked advantage that stable manure has over the artificial fertilizer, apple growers generally use it, when procurable in sufficient quantities, in preference to the latter. Not only does stable manure contain nitrogen, phosphoric acid, and potash which represent the three chief elements in plant food, but on account of its organic nature, when incorporated in the soil, it produces humus. This means that the physical, chemical, and biological nature of the soil is improved, and the humus provided absorbs and retains moisture in which the plant food is soluble and available to the feeding roots of the trees.

Proper drainage, good soil cultivation, with an occasional dressing of lime when necessary, favours bacterial activity by counteracting soil sourness or excessive and undesirable acidity.

Stable manure should be well rotted before being used in the orchard. Chemical changes taking place in its constituents through the

process of fermentation and decomposition render the plant food which it contains amenable to assimilation by the soil, and fits it to be absorbed by the feeding roots.

The amount of actual plant foods contained in animal manures is small compared with the artificial fertilizers, and when the quantity of the former procurable is not sufficient to meet the requirements of the orchardists, fertilizers are used either by themselves or in conjunction with the organic manures.

Organic manures improve the mechanical condition of all classes of soil, but the benefits they confer are most apparent in loose sandy loams and light silurian soils of the retentive character. Their incorporation in the former supplies humus, which absorbs and retains moisture, and acts as a repository for the plant food within easy reach of the roots. As well as generally enriching the latter, the organisms in the manure when decomposed multiply the soil's interspaces and prevent its packing hard. The amount of stable manure necessary for a dressing depends on the nature of the soil to be treated, its mechanical state and condition of fertility, the health of the trees, and the fruit prospects of the orchard for the following season. The best method of applying stable manure is to spread a fairly liberal supply of same over the whole of the trees' root-feeding areas during late winter, and it should be ploughed under as soon as the soil conditions become favorable in early spring.

It is desirable that the crude plant food contained in the manure should be made available in a soluble form for the feeding roots as soon as growth commences. This object may be attained by the early ploughing in of the manure to promote its decomposition, and facilitate the necessary chemical changes in its constituents which fit them for assimilation by the soil.

Artificial Manures.

Fruit-growers with orchards in the proximity of cities have mostly been obtaining their supplies of manure from stables connected with business establishments.

Owing to the great increase in motor traffic during recent years, however, the quantity available is becoming considerably restricted, and the orchardists are obliged to make up the deficiency with artificial manures.

It is realized that, owing to the apparent permanent shortage of stable manure, together with the increasing cost of labour and other expense in handling same, many orchardists will be obliged to rely entirely on artificial fertilizers, with green manure to supply the humus.

The fertilizers in most general use are superphosphate and bone dust. These are usually mixed in equal proportions, and, in the case of orchards in full bearing, applied in quantities varying from 7 lbs. to 10 lbs. per tree according to circumstances.

When the soil is of a stiff nature and liable to dry hard, it is advisable to mix this manure in the proportion of 2 of bone dust to 1 of super., as the latter, when used continuously on this class of soil, exaggerates the evil. But super. may, with advantage, preponderate in a mixture for use on friable clay or sandy soil containing plenty of humus.

This class of manure is generally applied prior to the flowering stage. The land is first ploughed, and while in the rough the fertilizer is distributed evenly over the whole of the trees' root pasturage, and then harrowed in.

Trees growing on soils deficient in potash are greatly benefited by an occasional dressing of this ingredient, which also seems to exert a special influence over fruit during its development by improving the quality and making the colour more attractive.

It has been previously stated that the deep red, friable soils of South Gippsland and Wandin produce large trees, which yield comparatively light crops of poorly coloured apples, while those on the shallow Silurian soils nearer to Melbourne grow only to average size, but return heavier crops of highly coloured fruit. The larger trees denote that the red soil is the richer in plant food, and in order to ascertain why, in the matter of fruit production, it performs in a manner contrary to what might be expected, samples typical of both soils were forwarded to Mr. P. Rankin Scott, Chemist for Agriculture, for analysis and report.

Hereunder is a copy of Mr. Scott's report. Samples Nos. 1 and 2 were of red surface soil and sub-soil from Monbulk, while Nos. 3 and 4 are corresponding samples of Silurian soil from Tunstall.

"Nos. 1 and 2 from orchard, Monbulk.
Nos. 3 and 4 from orchard, Tunstall.

The samples on analysis were found to contain:—

	Parts per 100,000.			
	I.	II.	III.	IV.
Nitrogen	212	187	117	58
Phosphoric acid ...	96	80	32	25
Potash	123	98	67	98
Lime	116	44	40	30
Magnesia	116	74	92	136
Chlorine	8	8	4	4
Reaction	Slightly acid.		Acid.	

On No. 1 soil from Monbulk apple trees grew luxuriantly, while on No. 3 soil from Tunstall the growth was not nearly so strong, but the yield of fruit was better and the apples more highly coloured. The physical character of these soils was vastly different, No. 1 being a nice friable red clay loam, while No. 3 soil was a light-coloured clay, and on the chemical analysis the former would be expected to produce better crops than the latter. Other points of difference are, however, worthy of note. I should say that No. 1 soil would be more retentive of moisture than No. 3, and consequently the trees would have stronger growth. No. 1 soil would also be less likely to pack hard on the surface, thus causing increased evaporation, which, of course, tends to check growth. The reason for the marked difference in the yield and colour of the fruit grown on these soils is largely a question of the physical characteristics of the soil. No. 1 soil is, however, more likely to produce stronger growth of foliage from its high content of nitrogen and its loamy nature."

Although apples cannot be profitably grown on these red soils, they are specially adapted to the cultivation of small fruits, and during recent years considerable areas in the Monbulk, Wandin, and Emerald districts have been planted with raspberries, loganberries, passion fruit, and strawberries.

(To be continued.)

WHEAT EXPERIMENTAL PLOTS IN THE MALLEE, 1917 SEASON.

DEPARTMENT OF AGRICULTURE.

By H. A. Mullett, B. Ag. Sc.

Experimental work has been carried out, under the supervision of the Department, at private farms in the Mallee during the last four years. The purpose of the work is to determine the most suitable manurial dressings and the best wheat varieties for the Mallee.

The trials were conducted at the farms of Messrs. H. W. Pickering, Ouyen; P. G. Stewart, M.L.A., Carwarp; and H. F. Hecht, Cowangie —three representative centres.

The past season in the Mallee was remarkable for the unusual rain during the growing period. The total rainfall for 1917 was over 20 inches, representing a 50 per cent. increase above normal. The heavy rains were responsible for an abnormal development of shoots and undergrowth, which to a certain extent interfered with the preparation of the land for seeding. Damage was also done to some of the plots by mice and rabbits.

1.—OUYEN CENTRE.

17.94 inches rain for year.

Manurial Trials—Sown with Federation wheat in duplicate plots, 45 lbs. per acre.

No manure	17 bushels per acre.
30 lbs. superphosphate ...	17.4 ,, ,,
60 ,, ,, ...	18.6 ,, ,,
90 ,, ,, ...	16.5 ,, ,,

Variety Trials—Seed 45 lbs. per acre, with 60 lbs. superphosphate.

Gluyas	23.2 bushels per acre.
Dart's Imperial	21.4 ,, ,,
Currawa	18.7 ,, ,,
Federation (acclimatised) ...	17.7 ,, ,,
Yandilla King	17.2 ,, ,,
Federation (Longerenong) ...	16.5 ,, ,,
Major	16.3 ,, ,,
Penny	15.6 ,, ,,
Federation (Rutherglen) ...	15.2 ,, ,,

2.—CARWARP CENTRE.

Total rainfall for year 20.16 inches. (Plots sown third week in May).

Manurial Trials—Sown with Federation wheat in duplicate plots, 45 lbs. per acre.

No manure	11.7 bushels per acre.
30 lbs. superphosphate ...	15.9 ,, ,,
60 ,, ,, ..	16.1 ,, ,,
90 ,, ,, ...	16.9 ,, ,,

Variety Trials—Seed 45 lbs. per acre, with 60 lbs. superphosphate.

Major	19.8	bushels	per acre.
Penny	19.4	,,	,,
Mac's White	19.4	,,	,,
Currawa	18.8	,,	,,
Dart's Imperial	18.3	,,	,,
Federation (Longerenong)...	18.3	,,	,,
Gluyas	18.1	,,	,,
Yandilla King	17.8	,,	,,
Federation (acclimatised) ...	16.4	,,	,,
Federation (Rutherglen) ...	16.0	,,	,,
Bunyip	11.2	,,	,,

Rate of Seeding Trials—Superphosphate, 60 lbs. per acre.

45 lbs. Federation per acre...	16.1	bushels	per acre.
37 ,, ,, ,,	13.9	,,	,,
26 ,, ,, ,,	12.7	,,	,,
15 ,, ,, ,,	11.8	,,	,,

Time of Sowing Test—Federation seed, 45 lbs. per acre, with 60 lbs. superphosphate.

May 18th	16.7	bushels	per acre.
June 18th	11.9	,,	,,
July 18th	6.8	,,	,,
July 18th (60 lbs. seed, 100 lbs. superphosphate) ...	8.7	,,	,,

Commenting on the results at Carwarp, the experimenter (Mr. P. G. Stewart, M.L.A.) said that while the manurial plots did not show the same striking differences as last year, they still showed in favour of heavier dressings than were used in the district.

The time of sowing tests showed markedly in favour of the early sown plots, in spite of the late season.

3.—COWANGIE CENTRE.

Manurial Trials—Sown with Federation wheat in duplicate plots, 45 lbs. per acre.

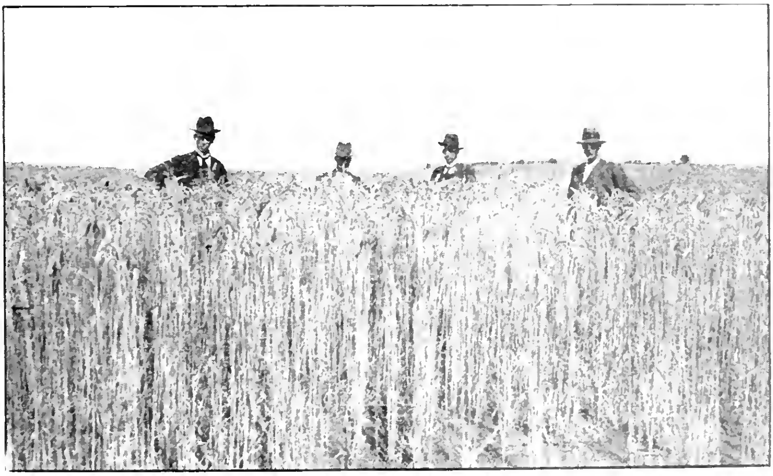
No manure	22.2	bushels	per acre.
30 lbs. superphosphate ...	22.7	,,	,,
60 ,, ,, ...	26.2	,,	,,
90 ,, ,, ...	25.3	,,	,,

Variety Trials—Seed 45 lbs. per acre, with 60 lbs. superphosphate.

Federation (acclimatised) ...	26.5	bushels	per acre.
Mac's White	25.3	,,	,,
Federation (Rutherglen) ...	24.2	,,	,,
Major	24	,,	,,
Gluyas	23.3	,,	,,
Federation (Longerenong) ...	23.1	,,	,,
Currawa	22.1	,,	,,
Dart's Imperial	21.2	,,	,,
Penny	21.1	,,	,,
Yandilla King	20.2	,,	,,

It will be noticed that higher yields have been obtained at each of the three centres from the plots which received heavier dressings of manure than are generally given by wheat-growers in the Mallee. In the variety trials the same varieties have given somewhat conflicting returns at the different centres. At Carwarp the list is headed by two

Manurial Trials, Cowangie Centre. Plot sown with 60 lbs. Manure.
Variety: Federation.

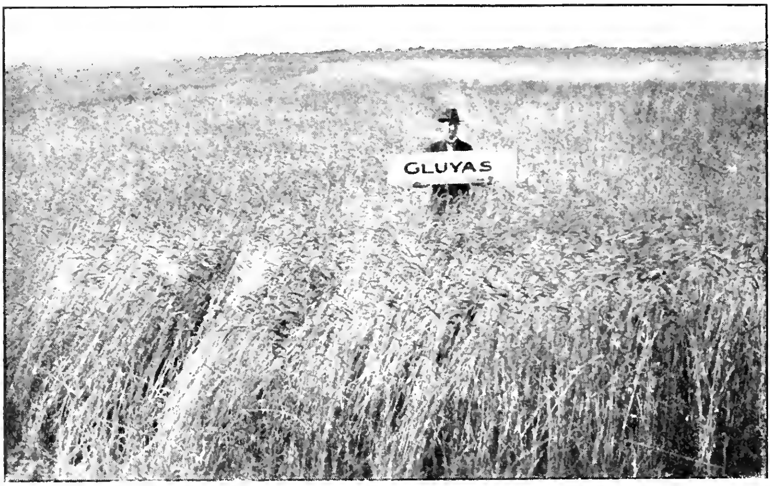


Variety Trials, Carwarp Centre, showing plot of Penny Wheat.

late wheats—Major and Penny—while at Ouyen these are at the bottom of the list. Federation has again demonstrated its suitability for Mallee conditions. Currawa, a late wheat, has also done well this season. At the two centres where it was grown, Mac's White, a favourite Mallee wheat, has beaten most other varieties, but it is a rather risky variety to grow as it shakes badly.

Perhaps the summary hereunder will most readily convey to readers the result of the various experiments. Mac's White heads the list with 22.3 bushels per acre; Gluyas and Dart's Imperial are next, while an interesting comparison is afforded between select-bred Federation that has become acclimatised, and select-bred Federation introduced from other districts. The acclimatised Federation was more prolific than the introduced Federation in two of the three centres.

The fact that the past two seasons have been phenomenally wet should not be lost sight of in studying the list. In ordinary years the early varieties do better.



Cowangie Centre.—Plot Sown with Gluyas Wheat.

Variety Trials—Summary for three centres—

Mac's White	22.3	bushels per acre.
Gluyas	21.5	,, ,,
Dart's Imperial	20.3	,, ,,
Federation (acclimatised) ...	20.2	,, ,,
Currawa	19.9	,, ,,
Major	20.1	,, ,,
Federation (Longerenong) ...	19.3	,, ,,
Federation (Rutherglen) ...	18.7	,, ,,
Yandilla King	18.4	,, ,,
Penny	18.7	,, ,,
Bunyip	11.1	(eaten by birds)

Manurial Trials—Summary for three centres—

	Yield per acre.	Increase due to manure.	Net profit per acre over cost of manure (wheat at 4s. bushel).
	bush.	bush.	s. d.
No manure	16.9	—	—
30 lbs. Superphosphate ...	18.6	1.7	5 4
60 ,, ,, ...	20.4	3.5	9 4
90 ,, ,, ...	19.5	2.6	6 4

The summarized results of the manurial trials prove that 60 lbs. superphosphate drilled in with the seed gave the most profitable return, showing the net profit over and above the cost of the manure of 9s. 4d. per acre, as against the no-manure plot, and 4s. per acre as against the usual dressing given in the Mallee, viz., 30 lbs. The 90-lb. dressing was not so profitable, and is probably too heavy for Mallee conditions, even in wet years like the last one.

The average dressing used in the district ranges from 30 to 45 lbs. of superphosphate. Experience of the past season's results, as well as that of previous years, has shown that this amount may be profitably increased up to 60 lbs. per acre.

The whole of the results are important in that they confirm the fact that the soils of the Mallee respond to fertilizers, and that certain varieties of wheat are more adaptable than others under conditions obtaining there.

Experience shows that wherever the introduction of better farming methods are rendered feasible by the conquering of the Mallee shoots, and overcoming other pioneering difficulties, wheat-growing is a highly remunerative industry.

In submitting the results of experimental plots at Carwarp, Mr. G. G. Stewart, M.L.A., writes at follows:—

"I notice a deal of criticism in the press as to why the Government experimental farms cannot show a profit, and I have worked out the loss to me occasioned by utilizing 30 acres of my land for experimental work, as compared with 30 acres of the same land not so devoted. The figures are:—

Total yield experimental plots (area 30 acres, includes spaces between plots)	380 bushels.
Total yield 30 acres, Currawa (field wheat), sown side by side with plots	486 ,,

At 4s. per bushel this works out as under:—

380 at 4s., £76. 486 at 4s., £97 4s.

In addition, two full days longer were taken with the drill and two extra days with the harvester. Allowing £2 per day for this work, it makes a total loss of £29 4s. on the experimental plots compared with the field wheat. This does not allow for the painstaking work of labelling, weighing, and tabulating the results.

I feel sure that the adverse criticism of the balance-sheets of the experimental farms conducted by the Victorian Agricultural Department arises from a lack of knowledge of the true character and objects of experimental work. My experience has been that no farmer, however expert, can conduct experiment work and make a profit; the real profit is not shown by the actual results obtained at the experimental farms themselves, but in the increased productiveness of the farms of the State as a whole due to such experimental work, and there is a big field for investigation. I believe there are hundreds of thousands of pounds lost annually to the farmer of this State in the wheat-growing industry alone through sowing wrong varieties of seed, wrong quantities of seed and manure, and sowing at the wrong time. If the average farms in Victoria were farmed with the same skill as the *best* farms of the State, it would mean an increase of millions of pounds annually to the wealth of the State, without the expenditure of one extra pound of capital or one hour more of labour."

INSPECTION OF FERTILIZERS.

A Review of the Analytical Results of Samples Collected during 1917.

P. Rankin Scott, Chemist for Agriculture, and Will C. Robertson, Supervising Analyst.

During the season 1917 sixty-eight samples were collected of the various brands of artificial fertilizers on the Victorian market.

The majority of the samples were withdrawn from parcels at the metropolitan consigning station, and from stocks at the factory. The remainder were obtained from stocks on hand in country stores and factories.

The samples collected included "superphosphates," "bone dust-superphosphate," "bone fertilizer-superphosphate," "superphosphate-bone," "nitro-superphosphate," "market garden manure," "bone dust," "blood-bone," "dried blood," and "animal fertilizer."

Approximately 60 per cent. of the parcels sampled consisted of superphosphate, and while this cannot be taken as an accurate guide, owing to the fact that all consignments inspected are not sampled, yet it serves to show the popularity of this form of fertilizer in Victoria.

An Analysis of the Analyses of Collected Samples.

The details of the analytical results of the samples collected have been published. (See this *Journal*, January, 1917.)

On striking an average from the results of these analyses, and likewise computing the value, some interesting information is obtained.

A comparison between these figures and those computed from the average guaranteed analysis is of importance in showing the farmer the guaranteed value and its relation to the calculated value, *i.e.*, the value supplied.

For the purpose of simplicity, the fertilizers are dealt with separately.

Table I.

Superphosphate.

Season.	Phosphoric Acid.								Average Price charged per Ton.	Average Guaranteed Value.	Average Calculated Value of Collected Samples.
	Water Soluble.		Citrate Soluble.		Citrate Insoluble.		Total.				
	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.			
	%	%	%	%	%	%	%	%	£ s. d.	£ s. d.	£ s. d.
1917 ..	17·32	17·00	0·73	0·50	0·81	0·50	18·86	18·00	4 15 0	4 16 8	5 0 1
1916 ..	17·70	17·00	1·18	0·63	1·36	0·90	20·24	18·53	4 7 6	4 10 9	4 13 9

These figures are highly satisfactory to the farmer, notwithstanding an increase in the price of the fertilizer equivalent to, approximately, 8 per cent.

The average guarantee is exceeded by the average analysis of the collected samples; moreover, the average guaranteed value per ton exceeds the average prices charged, while the average calculated value of the superphosphate supplied exceeds, in turn, the average guaranteed value.

If compared with previous year's figures (see this *Journal*, February, 1917), it will be noticed that there has been (*a*) an increase in the price of the fertilizer, (*b*) a rise in the average guaranteed value, and (*c*) an increase in the value of the collected samples.

The increase in price amounts to **seven shillings and sixpence per ton**, the increase in guaranteed value amounts to **five shillings and elevenpence**, while the increase in value of the fertilizer supplied amounted to **six shillings and fourpence.**

This means in round figures a 10 per cent. increase in the price per ton during 1917.

The increase in price is accompanied by a slight decrease in value. However, the superphosphate supplied is well above the guarantee, and this fact should not be lost sight of, for it means that upwards of 3,000 tons of superphosphate have been handed gratis by the manufacturer to the Victorian farming community.

Table II.

"Bone Dust-Superphosphate."

Season.	Nitrogen. Found.	Nitrogen. Guaranteed.	Phosphoric Acid. Water Soluble. Found.	Water Soluble. Guaranteed.	Citrate Soluble. Found.	Citrate Soluble. Guaranteed.	Citrate Insoluble. Found.	Citrate Insoluble. Guaranteed.	Total. Found.	Total. Guaranteed.	Average Price charged per Ton.	Average Guaranteed Value.	Average Calculated Value of Collected Samples.
	%	%	%	%	%	%	%	%	%	%	£ s. d.	£ s. d.	£ s. d.
1917 ..	2·06	1·50	9·00	8·50	3·26	5·25	7·60	4·25	19·86	18·00	5 17 6	5 7 8	6 1 8

Table III.

"Bone Fertilizer-Superphosphate."

1917 ..	1·42	1·33	10·19	8·33	1·79	3·17	5·72	5·67	17·70	17·17	6 3 4	4 10 9	4 16 1

Table IV.

"Superphosphate-Bone or Bone Fertilizer."

1917 ..	0·78	0·75	14·06	12·75	0·96	1·22	2·90	3·53	17·93	17·50	5 13 8	4 13 6	4 18 10

It will be seen that the "Bone-Super" mixtures are placed under three headings, viz., "Bone dust-superphosphate," "Bone fertilizer-superphosphate," and "superphosphate-bone fertilizer." The former is

a mixture of **bone dust** and superphosphate in equal proportions—a mixture true to name, and the only grade of this class of fertilizer the farmer is advised to buy. The second mixture consists of bone fertilizer and superphosphates in equal proportions. As bone fertilizer is a mixed manure in itself, containing rock phosphate, superphosphate, organic refuse of varying kinds and quality, gypsum or marl, and a small amount of bone dust, it will be readily agreed that this mixture is totally different from "bone dust-superphosphate," and should not be confused with the latter manure.

"Superphosphate-bone fertilizer" is similar in composition to "bone fertilizer-superphosphate," with this important exception—the former manure contains at the very least **75 per cent. of superphosphate**.

The figures in Tables II., III., and IV. will suffice to show the respective merits of these mixtures—the values conclusively proving "bone dust-superphosphate" to be the only admixture worth buying. During recent years there has been a marked scarcity in "bone dust" and the manure termed "bone-blood," which is produced as a by-product at freezing and meat preserving works, and is really a highly nitrogenous bone dust.

These fertilizers are much sought after in the southern districts of the State, and the scarcity is viewed with concern by some members of the farming community.

"Bone-blood" manures are rarely placed on the market in the simple condition. The freezing and meat preserving companies favour selling the total output in bulk. This is usually done by tender or contract, and in some instances enterprising orchardists or other intense culturists co-operate to buy the bulk, subsequently "dividing the spoil."

On the other hand there are many instances of this valuable fertilizer being bought by a broker or manufacturer. In the latter case it is used to reinforce or fortify some other manure or admixture.

This manure or admixture, containing a low percentage of nitrogen, may be totally unsuitable to the farmer who is requiring the concentrated unmixed "bone-blood" or "bone dust."

J. H. Kastle, Director of the Kentucky Experiment Station, writes*—"There can be no doubt that large sums of money are annually wasted in this State by buying fertilizers containing low percentages of nitrogen and potash. These small percentages add a great deal to the cost of the fertilizers, and do not give returns at all commensurate with their cost. Ten times our annual expenditure could profitably be made for fertilizers, but it should be made in general for phosphate and potash salts to supply deficiencies, and to use in the growing of leguminous crops to furnish humus and nitrogen. Our fertilizer manufacturers need to recognise the truth of this statement, and begin at once to supply these materials in the unmixed condition to farmers at the lowest prices possible."

In Victoria the most important fertilizers are those supplying phosphoric acid in readily available form. Hence we have our large output of superphosphate.

Yet there is a demand for nitrogenous phosphatic fertilizers, and to a lesser extent for nitrogenous and potassic manures.

The custom of growing leguminous crops with applications of phosphatic and potassic compounds, and subsequently ploughing the green

* Bulletin 191, June, 1915, Kentucky Exp. Stn.

crop under to ultimately suppy the soil with humus and nitrogen, is a good one, but it is not always applicable.

There are districts in the southern part of Victoria where a dressing of a nitrogenous phosphatic fertilizer such as "bone-blood" or "bone dust" proves very useful, and the manufacturer selling this fertilizer in the unmixed condition to the farmer at a fair price is doing his country, the farmer, and himself, a good turn.

"Breaking down" a fertilizer containing from 4 to 7 per cent. of nitrogen to "build up" another, so that it will contain from 0.75 to 1.5 per cent. of this element, is practically destroying the former fertilizer altogether, and producing a mixture little better and more costly than the original, which has undergone the "building up" process. You cannot have the apple and eat it. Needless to say, in the compounding of manures the unit value of the fertilizing elements or compounds, viz., nitrogen, phosphoric acid, and potash, is considerably increased, and it follows that this increase is greater when the manufacturer is asked to mix.

The price of 1 per cent. nitrogen in "bone-blood" or "bone dust" is increased both directly and indirectly when used in admixture.

From the economical stand-point the farmer should remember that he pays a higher rate for nitrogen, phosphoric acid, and potash in "mixed" fertilizers than he does for the same in the simple fertilizers.

It must be borne in mind that manufacturers produce fertilizers according to demand, and the farmer should know full well that the more he asks the manufacturer to handle fertilizers the higher will be the price to be paid per ton. This is true in ordinary times, but during the present era of stress and labour shortage the price undergoes a marked increase.

Referring once again to the fertilizers mentioned in Tables II., III., and IV., viz., "bone-supers," the farmer should demand "bone dust superphosphate." Failing to obtain this he should buy the manures separately, and mix them on the farm, *i.e.*, if the mixture is absolutely essential.

The point to be impressed upon the farmer is this: Given that applications of phosphoric acid and nitrogen are profitable, apply nitrogenous and phosphatic fertilizers, but apply them in the cheapest manner possible.

This does not mean buying and applying the cheapest rubbish on the market, but rather buying the high-grade simple manures at a reasonable price, and either mixing them on the farm or applying them to the soil in the simple condition.

Endeavours should always be made to keep the unit values of the essential fertilizing element or compound as low as possible.

During the past season the "mixed" fertilizer termed "bone fertilizer-superphosphate," was sold at a monetary depreciation of 22 per cent., whilst in the case of that sold as "superphosphate-bone" the difference in value between the prices charged and value received amounted to 13 per cent. in favour of the former. (*See* Tables III. and IV.)

On the other hand, the single sample of "bone dust superphosphate" collected, which was made by a country manufacturer, showed on the unit value computation, higher value received than was charged for. (*See* Table II.)

Table V.

Nitro-Superphosphate.

Season.	Nitrogen.		Phosphoric Acid.								Average Price charged per Ton.	Average Guaranteed Value.	Average Value of Collected Samples.
			Water Soluble.		Citrate Soluble.		Citrate Insoluble.		Total.				
	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.			
	%	%	%	%	%	%	%	%	%	%	£ s. d.	£ s. d.	£ s. d.
1917 ..	1·98	2·00	13·45	13·00	0·63	0·39	1·46	1·26	15·05	14·88	6 10 0	5 15 10	6 0 8

This fertilizer is another mixture, made by (*a*) reinforcing superphosphates with ammonium sulphates or nitrate of soda and a little organic refuse containing slowly available nitrogen, or (*b*) reinforcing superphosphate with dried blood. The samples collected analyzed well up to the guarantee, and a glance at Table V. will show that the value of the fertilizer supplied was satisfactory. The fact remains, however, that the unit value of nitrogen in the ammonium sulphate, nitrate of soda or dried blood, as the case might be, was considerably increased by admixture.

Table VI.

Market Garden Manure.

Season.	Nitrogen.		Phosphoric Acid.								Average Price charged per Ton.	Average Guaranteed Value.	Average Calculated Value of Collected Samples.
			Water Soluble.		Citrate Soluble.		Citrate Insoluble.		Total.				
	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.			
	%	%	%	%	%	%	%	%	%	%	£ s. d.	£ s. d.	£ s. d.
1917 ..	4·06	4·00	8·03	7·65	1·62	0·22	1·86	2·32	11·51	10·19	7 0 0	5 16 4	6 5 7

This fertilizer is simply another admixture of superphosphate, ammonium sulphate, and organic nitrogenous refuse. It contains a fair amount of nitrogen, and is perhaps a serviceable mixture. The analyses of the samples collected show that the manure is well above the guarantee, but the price charged exceeds the calculated value by approximately 15s. per ton (*see* Table VI.), and affords another example of how the unit values are increased in "mixed" fertilizers.

Table VII.

"Bonedust."

Season.	Nitrogen. Found.	Nitrogen. Guaranteed	Phosphoric Acid. Found.	Phosphoric Acid. Guaranteed	Average Price charged per Ton.	Average Guaranteed Value.	Average Calculated Value of Collected Samples.
	%	%	%	%	£ s. d.	£ s. d.	£ s. d.
1917	4·55	4·23	20·21	20·87	6 5 0	7 17 3	7 18 6

The figures in this table are eminently satisfactory. The analyses of collected samples agree with the guarantee, while the unit values, as shown by the value of the collected sample, are considerably lower than those originally calculated at the beginning of the season.

Table VIII.

"Animal Fertilizer."

Season.	Nitrogen. Found.	Nitrogen. Guaranteed.	Phosphoric Acid. Citrate Soluble. Found.	Phosphoric Acid. Citrate Soluble. Guaranteed.	Phosphoric Acid. Citrate Insoluble. Found.	Phosphoric Acid. Citrate Insoluble. Guaranteed.	Total. Found.	Total. Guaranteed.	Price charged per Ton.	Guaranteed Value.	Average Calculated Value of Collected Samples.
	%	%	%	%	%	%	%	%	£ s. d.	£ s. d.	£ s. d.
1917 ..	3·13	3·00	4·40	4·00	12·44	12·00	16·84	16·00	7 0 0	5 3 6	5 8 8

This animal fertilizer is a "bone fertilizer" of low grade. The analysis of the collected sample agreed with the guarantee, but the price charged is altogether out of proportion to the calculated value. Farmers can do much better than to buy manures of this description.

Table IX.

"Bone-Blood."

Season.	Nitrogen. Found.	Nitrogen. Guaranteed.	Phosphoric Acid. Citrate Soluble. Found.	Phosphoric Acid. Citrate Soluble. Guaranteed.	Phosphoric Acid. Citrate Insoluble. Found.	Phosphoric Acid. Citrate Insoluble. Guaranteed.	Total. Found.	Total. Guaranteed.	Price charged per Ton.	Guaranteed Value.	Calculated Value of Collected Sample.
	%	%	%	%	%	%	%	%	£ s. d.	£ s. d.	£ s. d.
1917 ..	6·74	5·50	5·18	6·36	7·21	7·03	12·39	13·39	10 0 0	7 1 2	7 16 5

This fertilizer was manufactured in another State, and freight and shipping charges have increased its cost to such an extent that the calculated value compares very unfavorably with the price charged, and yet the fertilizer would probably show a profitable return to the farmer who used it. It is high grade, in a fine condition, and unadulterated.

Table X.

"Dried Blood."

Season.	Nitrogen.		Price charged per Ton.	Guaranteed Value.	Calculated Value of Collected Sample.
	Found.	Guaranteed.			
	%	%	£ s. d.	£ s. d.	£ s. d.
1917	10·59	8·75	10 0 0	7 13 1	9 5 4

This sample of dried blood was a very fair one. The analysis of the collected sample showed it to be well above the guarantee. The price charged exceeded the calculated value, but in view of the great scarcity of dried blood during the season this can readily be understood. The fertilizer was in the pure condition, and would be fair value at the price charged.

The analyses of all samples collected during the season were satisfactory, not one single instance of a deficiency exceeding the limits allowed by the Act coming under notice.

This is only as it should be. The farming community is being asked to pay high prices for fertilizers, and it is only fair that they should be of good quality and well up to the guarantee.

Correction.

In the *Journal of Agriculture* for last month, page 48, the result of the analysis of Mount Lyell Superphosphate No. 1 (Sample 957) was incorrectly given. It should have read:—

Phosphoric Acid.

Water Soluble.	Citrate Soluble.	Citrate Insoluble.	Total.
17.27	0.62	0.69	18.58

DISEASES OF FRUIT TREES AND THEIR TREATMENT.

By H. W. Davey, F.E.S., Orchard Supervision Branch.

The number of pests that attack cultivated plants is legion, many of which are now cosmopolitan, and this to such a degree that their country of origin is not always known for a certainty. It is well known that many plants and animals thrive better in a new country, than in the one to which they are indigenous. Some of the reasons for this is the absence of natural controls such as climate or the absence of parasites, either insects or fungi. An abundant food supply always favours this increase, and it is easily seen that where such crops as fruit trees are grown year after year this ensures an unbroken food supply to the pests attacking them, whereas the same pests attacking plants under purely natural conditions would have to travel greater distances to find suitable host plants.

In dealing with insect pests it should be borne in mind that the mission of many insects is to assist nature in removing trees that are low in vitality, so as to make room for healthy ones. This can easily be proved by ringbarking a perfectly healthy tree, and noticing how readily it is attacked by insects that previously left it alone. From this we learn the necessity of keeping trees and plants in as thrifty a condition as possible. In the economy of nature, many insects are useful in lessening the seed production of some plants, and thus aid in preventing their undue increase, but unfortunately they show no discrimination when plants of a kindred nature are being grown for profit.

In combating injurious insects bv means of spraying, it is of the greatest importance that this should be done thoroughly, and care taken that no part of the sprayed plant is missed by the material, otherwise such insects as aphides are in a very brief time able to again infest the tree from a few surviving individuals.

With insects that secrete waxy filaments such as Woolly aphis, the nozzle of the spray pump should be held close up to the parts to be sprayed, so that sufficient force may be applied to wash away the flocculent protective covering beneath which the insect shelters.

The time of application, together with thoroughness, if combined with some knowledge of the pest to be fought, is the essential for success. Clean cultivation is also important, as, apart from its physical effect on the soil, it also destroys cover for pests of various sorts. The head-lands should be cultivated, for if allowed to support a riot of weeds, these are a prolific source of invasion of enemies to the fruit-grower.

The chief insects which the horticulturist has to combat may be grouped as follows:—

1. Chewing insects that feed on exposed leaf surfaces.
   Examples.—Pear and Cherry Slug, Pumpkin Beetle and most caterpillars.
   Treatment.—Spray with arsenate of lead.
2. Chewing insects that are exposed for only a short time.
   Examples.—Codlin Moth, Light Brown Apple Moth.
   Treatment.—Arsenical sprays. Picking affected fruit, and bandaging.

3. Chewing insects living in tunnels eaten out by them in stems or branches.
   Example.—Cherry and Peach Borer Caterpillar.
   Treatment.—Spraying is of very little or no value. Inject carbon bi-sulphide into tunnel and plug up entrance with soft clay.
4. Chewing insects that move freely about and often feed at night.
   Examples.—Weevils.
   Treatment.—Arsenical sprays. Root borer traps. Jarring insects from trees, collecting and destroying.
5. Suctorial insects, more or less permanently fixed to their host plant.
   Examples.—Scale insects.
   Treatment.—Oil sprays or fumigation with hydrocyanic acid gas.
6. Suctorial insects that move about on branches.
   Examples.—Aphides, Red Spider.
   Treatment.—Oil sprays when trees are dormant and tobacco sprays when trees are active.
7. Suctorial insects that are free-moving and active fliers.
   Examples.—Rutherglen and other plant-feeding bugs.
   Treatment.—Phenyle sprays.
8. Fly maggots infesting fruit.
   Examples.—Fruit flies.
   Treatment.—Destroy infested fruit by boiling, keep soil beneath trees well stirred. Spraying is of no value.

From the diversity of insect pests attacking fruit trees, it can be seen that before attempting to combat them a true diagnosis of the disease must first be made, as in the case of disease attacking higher life, otherwise the operator can have but little hope for success. If a correct diagnosis be not made, a fungicidal spray may be applied when it should have been an insecticide, or *vice versâ*.

The following remedies given are those commonly advocated by officers of this branch.

Codlin Moth.—The eggs are usually deposited on fruit or leaves at intervals of time. The caterpillar, on hatching, feeds for some time on the hair-like threads in the eye or calyx of the apple, and later usually enters the fruit at this point. This applies principally to caterpillars of the first brood, later broods entering the fruit at any point. Spray trees with arsenate of lead (1 lb. to 20 gallons of water) before the calyx or eye of fruit closes; give a second application from ten to fifteen days later, and subsequent sprayings should be given at intervals of not longer than thirty days, four or five sprayings being necessary—the latter number for late varieties.

Cherry and Pear Slug.—Spray with arsenate of lead as soon as leaves have developed, and while the fruit is small and green. A second spraying, if necessary, can be made after the fruit has been picked.

Root Borer.—So far, the only methods adopted for coping with this pest are by trapping and poisoning with arsenate of lead; trees sprayed on warm days give better results, owing to the beetles drinking the liquid, than on cool days. Trees should be regularly examined for beetles from spring until January.

Woolly Aphis.—Orchards in low-lying, damp situations are the most difficult to keep clean, some varieties of apples, notably the Rokewood,

Spitzenberg, Statesman, Granny Smith, and Rome Beauty, amongst leading varieties, being specially prone to attack from these insects. Thoroughness in spraying is of the greatest importance, and care should be taken not to allow galls to form, as after these have developed the difficulties of eradication are enormously increased. The spray should be applied first as soon as leaves have fallen, or even earlier, and the second spraying should be given early in August. For these applications use red oil at a strength of one gallon of oil to 25 gallons of water. If aphis be present in summer, the trees may be sprayed with tobacco water, made as follows:—Soak 1 lb. of tobacco stems in $1\frac{1}{2}$ gallons water (first placing tobacco in a bag); if washing soda is added at rate of $\frac{1}{2}$ lb. to every 50 gallons of water, it will greatly assist in the extraction of the nicotine.

Peach Aphis.—The most effective treatment for these pests is a thorough spraying with red oil in early spring or late winter at strength of 1 in 30. For dealing with these aphides after the trees have become active, make a thorough spraying with tobacco wash—2 lbs. tobacco to 4 gallons water.

Mussel Scale.—Spray in early winter with red oil—1 gallon of oil being used to 20 of water. All loose bark, &c., should be removed from tree. Watch trees closely in spring (usually about November) for young scales hatching, a tobacco spray at this time being very effective.

San Jose Scale.—The same treatment as recommended for mussel scales during dormant period. For summer treatment, use the self-boiled lime-sulphur wash at summer strength, choosing a cool day for that purpose. Sixteen pounds of fresh burnt lime or 13 lbs. of flowers of sulphur, will suffice to make 80 gallons of winter spray or 240 gallons of summer spray. To prepare, place lime in barrel which has previously been rinsed with boiling water to warm it; mix the sulphur in a convenient vessel with boiling water added slowly, until the sulphur is well mixed into a somewhat stiff paste, then add more boiling water, 4 gallons in all. The lime in the barrel should be slaked simultaneously with four gallons of boiling water, and the suphur mixture added. Stir the lot up well with a wooden spade or flat stick, and then cover up with two or three bags to retain the heat. If everything is done promptly, the mixture should continue to boil for 30 minutes. It is best used when freshly made.

Olive Scale.—During the winter months it is difficult to reach these insects when infesting citrus trees, and the most effective time for dealing with this pest is in March, either by fumigation or spraying. At this time of the year these insects are mostly small and immature, and the trees, having at this time ripened their growth, are less liable to sustain damage from either gas or oil applications. Red oil may be applied at a strength of 1 in 40. When this scale occurs on deciduous trees, they can be treated with red oil at winter strength during the winter months. The same treament can be given for the Red scale.

In dealing with scale insects it should be borne in mind that it is difficult to destroy matured scales and their eggs, but when first hatched the young are exceedingly delicate little creatures, and are at this stage easily killed by almost any weak contact insecticide. But if they are permitted to settle down and start feeding, they immediately commence to form the protecting scale, and as this increases in size so the difficulties in reaching the insect beneath becomes greater, and consequently washes of greater strength become necessary.

Rutherglen Bug or Chinch Bug (*Lygaeidae*).—These insects, often wrongly called flies, are very destructive, feeding mostly on grasses or shrubs, and in some seasons becoming very serious pests to the orchardist and farmer.

When these bugs make their appearance in plague numbers, the most effective treatment, as well as the cheapest, appears to be spraying them with phenyle, the formula for its preparation being as follows:—Boil 1 bar of yellow soap with 3 lbs. of washing soda until thoroughly dissolved, then add 1 quart of phenyle and make up to 40 gallons with water. If preferred, Benzole emulsion could be used at strength of 1 in 4, but this is a much more costly preparation than the phenyle.

Fruit Bugs (*Pyrrhocoridae*), commonly called Soldier bugs, are frequently a pest in suburban gardens. They are exceedingly fond of greasy bones, and if a few of these be laid down (the large bones are best), where these insects most congregate, they will attack the bones in large numbers, and they may then be easily killed by pouring boiling water over them. This at the same time brings more grease to the surface of the bones, thus keeping them attractive to the bugs. In dealing with plant bugs, clean cultivation is of the very first importance.

Red Spider.—Spray when trees are dormant with red oil at winter strength—1 in 30.

Thrips.—These insects are often troublesome to late blooming varieties of apples, particularly the Five Crown and Rome Beauty, and especially so should the spring prove a dry one. Oil applications during the winter months probably affords some slight protection, but thoroughly spraying the trees with tobacco wash (same strength as for aphis) as soon as thrips start to become plentiful is the best method of control. Spraying must be thorough to be effective. The mixture should be applied at high pressure, and forced down on to the ends of the buds rather than applied on their sides. The nozzle should be held close to the buds, two or three sprayings being usually necessary. In preparing tobacco sprays, the tobacco should not be boiled, but placed in a bag and allowed to soak for three or four days.

Fungus Diseases.

Fungus diseases are caused by minute vegetable organisms attacking plants of a higher order, and in some seasons the losses caused are very serious, and humid conditions are very advantageous for most of them. Where the drainage of land is bad, the conditions are usually very favorable for the rapid propagation of these minute plants. In spraying against fungus diseases, it should be borne in mind that treatment should be always preventative rather than curative, for once these organisms enter their host plant they are beyond the reach of effective treatment. The aim of the horticulturist should be to coat with a fungicidal spray the plant to be protected, so that the spore of the disease, on germination taking place, would come into contact with the fungicide that separates it from its host plant, and thus cause its death. If the tree has not been protected bv coating it with a fungicide, the spore on germination sends out mycelial threads, which find their way beneath the skin of the host plant and commence to feed on its tissues. The skin and tissue of the affected parts are killed, and it is the inability of these dead parts to expand and keep pace with the growing parts of fruit that causes the cracks in apples and pears when attacked by Black Spot fungus.

Black Spot or Scab in Apples and Pears.—Spray trees as soon as buds separate from one another, so that the spray can run down the flower stalk, using either Bordeaux Mixture (6.4.50 formula) or Copper Soda Spray (6.8.50 formula—6 lbs. blue stone, 8 lbs. washing soda, 50 gallons water); for late or summer spraying, using this at half strength.

Shot Hole of Stone Fruits.—Spray with Bordeaux Mixture or Copper Soda before flowers open. Spraying as soon as leaves have fallen is advised for trees that have suffered badly from attacks of this disease.

Peach Curl.—Spray with Bordeaux Mixture as soon as buds swell in spring, and just before the leaf buds burst. A spraying with bluestone (1 lb. in 25 gallons of water) has given good results when immediately followed by an oil spray at strength of 1 in 25.

Shot Hole of Apricot.—Spray with Bordeaux Mixture or Copper Soda spray when the buds are showing pink.

Armillaria.—This is a root-killing fungus, and is very destructive to trees in certain soils, such as some of the red and sandy soils that have a cement sub-surface, especially on land that has not been thoroughly cleaned of roots of native trees previous to planting. Several remedies are recommended for coping with this disease, among which Sulphate of Iron, Bordeaux Mixture, and Bordeaux Paste are the principal. One thing that should be borne in mind is that summer treatment is likely to prove dangerous to the tree. Bordeaux Paste is applied after baring the roots, which, if done in hot summer weather, must be injurious to the tree. Again, if drenching with a fungicide to the soil sufficient to reach the disease on the roots is given in hot weather, when the roots are in a most active condition due to the rapid transpiration of water by the leaves, trouble is likely to result, and probably the tree will die. The best time to make root applications is during the winter months, or after heavy rains in autumn.

Bordeaux Paste is made as follows:—

Sulphate of Copper (Bluestone), 1½ lbs
Quicklime, 1 lb.
Water, 2 gallons.

Remove soil and apply to roots with a brush.

Bordeaux Mixture, 6.4.50, sprayed on roots.

Sulphate of Iron, 1 lb. in 4 gallons of water, sprayed on roots.

In preparing Bordeaux Mixture three vessels are used, preferably of wood (iron vessels must on no account be used in its preparation). Formula, Bluestone, 6 lbs.; Quicklime, 4 lbs.; Water, 50 gallons. Dissolve the bluestone in a barrel with 25 gallons of water, and in another barrel slake the lime and make 25 gallons of lime-water. These two lots of 25 gallons should be poured evenly into a third vessel, keeping it well stirred at the same time. A test can be made on this mixture by inserting a clean knife-blade into it for a minute or two; if the steel bronzes it shows the presence of free copper in the solution, and a little more lime should be added until the knife-blade shows clean. In bad seasons, it may be of advantage to lessen the water to 40 gallons, both in the Bordeaux Mixture as well as in the Copper Soda spray. In the preparation of the latter spray, the same method is adopted as in the Bordeaux, only the washing soda takes the place of lime. In the preparation of any spray, good, soft water should be used. Bordeaux

requires stirring before using; this is usually done when running the lime-water and bluestone into the spray pump or third vessel.

Bordeaux Mixture (French method) is made up as follows:—

Materials.

Copper Sulphate, 10 lbs.
Fresh Quicklime, 5 lbs.
Water, 50 gallons.

If the lime is of poor quality or air-slaked, more than 5 lbs. will be required.

Utensils.

A 60-gallon hogshead with one head removed; pegs should be inserted inside to show the 10 and 50-gallon levels.

Two or three kerosene tins for boiling water in.

A tub or tin to slake the lime—capacity about 10 gallons.

An earthenware jug or jar—capacity 1 gallon.

A dipper—enamelled or painted inside and out.

A fine sieve.

Some phenolphthalein testing paper.

A broom-handle to stir with

Operations.

Dissolve the copper sulphate in 5 gallons or so of hot water, make up to 10 gallons with cold water.

Remove one gallon of this solution in the earthenware jug or jar and place it to one side.

Add about 20 gallons of water to the copper sulphate solution in the cask (this need not be measured).

Slake the quicklime by adding small quantities of water at a time. When slaked, add water sufficient to make about 6 or 8 gallons of milk of lime.

Pour this lime milk through the sieve into the bulk copper sulphate solution, with brisk stirring until neutralized. Neutralization is shown by the phenolphthalein paper turning pink. Stop adding lime milk as soon as the test paper turns faintly pink. (The test paper can with advantage be pinned to a small stick to avoid touching with fingers wetted with lime water, which would result in misleading indications.)

Add 1 gallon of Copper Sulphate solution previously wthdrawn; stir thoroughly.

Make up to 50 gallons with water, and stir again.

The mixture is now ready for use. It should be used fresh, only sufficient for the day's requirements being made up at one time.

A stock solution of Copper Sulphate—1 lb. to 1 gallon of water—may be made up. This will keep indefinitely. Ten gallons of this stock solution should be taken for each cask of mixture. Copper Sulphate Solution must not be handled in iron or tin vessels unless these have been very thoroughly painted or tarred both inside and out. wood or enamel vessels are to be preferred. Copper Soda may be prepared in similar manner to above, but about half as much again of soda would be required, as in the case of lime. Phenolphthalein test paper can be obtained from any chemist. It consists of strips of white filter paper wetted with a 5 per cent. solution of phenolphthalein in methylated spirit and allowed to dry.

Collar Rot in Citrus Trees.—Cut away diseased bark until healthy tissues are met with, and swab parts with carbolic acid and water in equal parts. Covering wounds with grafting wax, &c., facilitates rapid healing.

Chlorosis is recognised by the leaves showing pale yellow blotches due to the lack of chlorophyll The best treatment for trees so affected is an application of 1 lb. superphosphate with ¾ lb. of sulphate of iron per tree

BEE-KEEPING IN VICTORIA.

By F. R. Beuhne, Apiculturist.

XXVI. THE HONEY FLORA OF VICTORIA.

(Continued from page 307, Vol. XV.)

The Bottlebrushes (*Callistemon*).

The Bottlebrushes are a genus confined to Australia. There are sixteen species, eight of which are native to Victoria. They are closely allied to the Honey Myrtles or Bottlebrush Tea-trees (*Melaleuca*), which they resemble remarkably in their floral characters, differing from them, however, in the length and breadth of their leaves and the length and colour of the stamens of the flower. The features which distinguish the Bottlebrushes from the Honey Myrtles or Bottlebrush Tea-trees are the larger leaves as well as the longer stamens of the former, which are always over half an inch in length while those of the Honey Myrtles do not exceed half an inch.

All the Bottlebrushes yield nectar and pollen, and although the honey obtained from them cannot be considered of the best quality, these shrubs are nevertheless of great value to the bee-keeper in the localities where they grow, as they provide nectar and pollen in October, November, and December, according to the species, a time when both these bee foods are most needed for the full development of the colonies.

The Crimson Bottlebrush (*Callistemon lanceolatus*).

The Crimson Bottlebrush is usually a tall tree, sometimes attaining a height of 30 feet, but occasionally the shrubs are low and bushy. The leaves are lance-shaped, variable in breadth, usually pointed, and from 1½ to 2 inches long, but varying from 1 to 3 inches. The crimson flower spikes are from 2 to 4 inches long, and not very dense. The petals are greenish or reddish, and the stamens crimson, in some specimens deeply coloured, in others much paler, more slender, and scarcely above half an inch in length. The Crimson Bottlebrush is found in East Gippsland. It yields both nectar and pollen, and flowers generally in October.

The Scarlet Bottlebrush (*Callistemon coccineus*).

A shrub very closely allied to the Crimson Bottlebrush. The leaves are lance-shaped, rigid, almost pungent, from 1 to 1½ inches long, the mid rib prominent The flowers are scarlet, not very dense, stamens ¾ to 1 inch long, with yellow anthers.

The Scarlet Bottlebrush is found in the Grampians country and flowers in November and December. Like most of the Bottlebrushes it frequents the banks of rivers and creeks, and other moist situations.

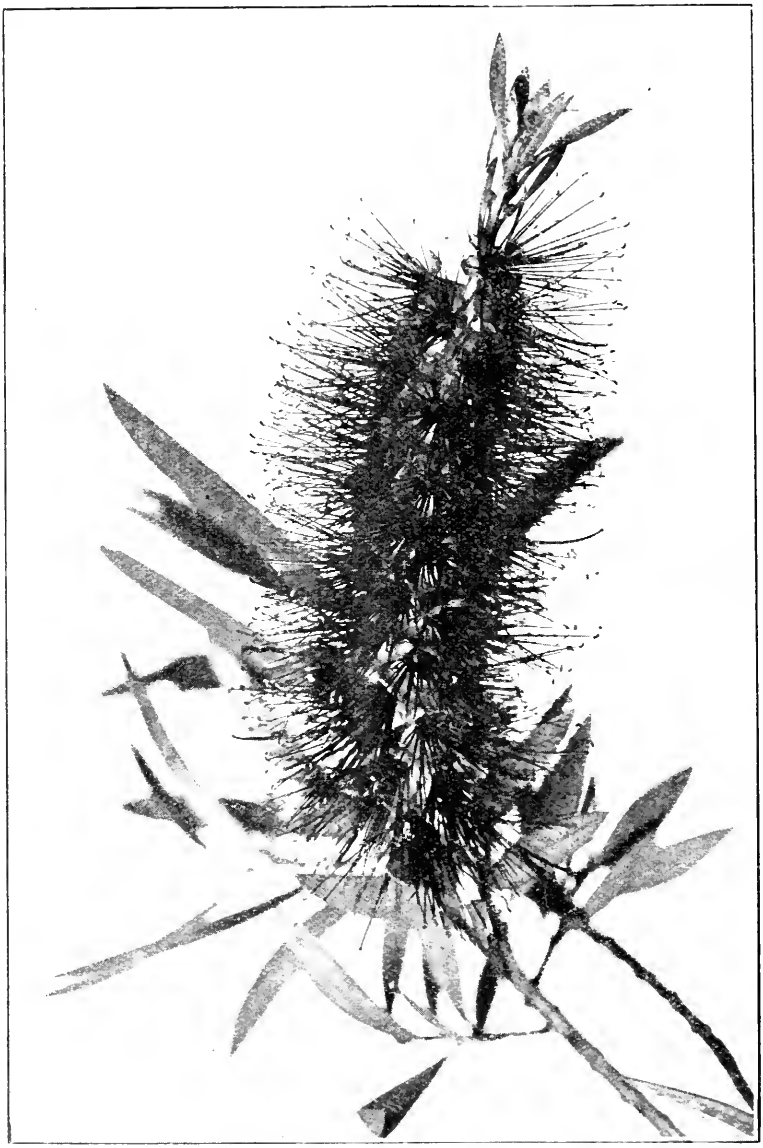


Fig. 67.
The Scarlet Bottlebrush (*Callistemon lanceolatus*).

The Willow Bottlebrush (*Callistemon salignus.*)

A tall shrub or small tree, attaining sometimes 30 to 40 feet in height, and often indistinguishable in foliage and flowers from the

Crimson Bottlebrush (*Callistemon lanceolatus*) The leaves are, however, usually more pointed, and the flowers generally smaller, than in the Crimson Bottlebrush.

It is found in all parts of Victoria, particularly along the Yarra, Ovens, Goulburn, and other rivers. It is a nectar and pollen producer like the other species.

The Swamp Bottlebrush (*Callistemon paludosus*).

A species with narrow, almost linear, leaves, growing in swampy localities. No data as to its honey or pollen yielding qualities are so far available.

The Mountain Bottlebrush (*Callistemon Sieberi*).

This is a mountain species with short, almost linear, leaves, from ½ to ¾ of an inch in length, and red flowers, usually in short spikes.

The Pine Bottlebrush (*Callistemon pithyoides*).

A tall shrub confined to the north-east of the State. The leaves are linear, more or less distinctly channelled on the upper side, rigid, blunt, or sharply pointed, from 2 to 4 inches long, resembling pine leaves, hence the name. The flowers are rather large and of a dull yellowish-green, including the anthers.

The Narrow-leaved Bottlebrush (*Callistemon linearis*).

Usually a tall shrub with narrow linear leaves, from 2 to 5 inches long, blunt or sharp-pointed. The flowers are large, with stamens about 1 inch long, dark or pale red, sometimes greenish

The Prickly Bottlebrush (*Callistemon brachyandrus*).

The Prickly Bottlebrush is a tall, stiff, bushy shrub or small tree, the young shoots softly hairy. The leaves are linear, channelled above, rigid, and sharply pointed, and from ¾ to 1½ inches in length. The flower spikes are loose and interrupted, or sometimes dense, and rarely 2 inches in length. This species is found in the Murray Desert.

A WATER WEED AT TOOROURRONG.

By Alfred J. Ewart, D.Sc., Ph.D.

(Government Botanist of Victoria, and Professor of Botany and Plant Physiology in the University of Melbourne).

The Metropolitan Board of Works makes use of an artificially constructed lake at Toorourrong for settling the water derived from the Plenty Ranges and Wallaby Creek system. Such a lake is bound, in course of time, if it fulfils its function, to silt up slowly, and thus become liable to be choked by water weeds.

The weed *Vallisneria spiralis* was present at one point in the lake for many years without spreading, but suddenly in one season extended over a much larger area, so that the problem of either suppressing it or keeping it within bounds became of importance. This weed has spread over large areas of Europe, Asia, America, Africa, and Australia. It grows in stagnant, or slowly-flowing water, chiefly where there is a muddy bottom, and, if too abundant, might have a tendency to affect the quality of the water in autumn owing to the presence of large numbers of its decaying leaves.

It spreads in two ways:—

(1) Vegetatively, by lateral stolons rooting at their ends. These are formed from early spring to late autumn, but the plant rarely extends in this way more than 1 to 3 feet per year.

(2) By seeds, which float for a time and then sink. They ripen in summer—usually from January to February—and the plants flower from about the end of November to end of December. The plants at Toorourrong were just commencing to flower on 27th November last. Ripe seeds are developed only when both male and female plants are present; but, even then, it often happens that no fertile seed are formed for one or two years in succession. Specimens of both male and female plants were found in flower on the lake.

The seeds germinate in late summer, when, under natural conditions, the water-level is low, and the growth keeps pace with the rise of the water-level later on. If the water level be high the seeds may remain dormant until the following summer. At a depth of 6 feet, the seeds are unable to form seedlings, but if started at a depth of 2 or 3 feet, they will grow with the rise of the water up to 6 feet. The sudden increase of the weed in the lake at Toorourrong was due to the level being low at a time when the plant had had a successful seeding season, and the seeds were able to germinate.

Modes of Treatment.

1. The most effective method would be to drain the lake, and scoop or cut away not less than 3 inches of the top layer of the silt wherever the plant was growing. In some parts, this would be a difficult task, for where there was any depth of silt, it would take months to become firm.

2. The mere exposure of the infected area during a hot, dry summer until the plants and mud were dry would reduce the growth very greatly in the following season, provided the area was allowed to dry for not less than three months, and that draining took place before any seeds had been formed.

3. Raking the plants off the bottom from a boat is comparatively ineffective, as sufficient plants and rooted stolons are left behind to re-establish the weed in the following year.

4. Cutting the weeds by dragging a knife behind a boat, or by using a cutting machine—as is done on Lake Wendouree—will keep them down for one season, but, to exhaust the plants, needs repeating at least three times a year.

5. The most practicable mode of treatment would be to deepen the lake by raising the banks, and then to cut the weeds as closely as possible before raising the water level to the new height, and before seeding takes place—that is previous to the month of January. During the dangerous seeding months—January to March, or, occasionally in late seasons, April—the lake should, if practicable, be kept at its full depth. When once *Vallisneria spiralis* has got a hold, it will almost inevitably travel up to newly-submerged shallower parts, and also to areas which are silting up; but it spreads slowly upwards as compared with its rate of spread with the current, however slow the latter is. Hence, by the last-mentioned method of treatment, it would be possible in the future to keep the weed within bounds with a minimum of trouble.

NURSERY STOCK.

As citrus culture has during the past few years received attention from growers in the irrigated areas of the northern part of the State and is capable of considerable extension without the risk of over-production it is necessary for growers to understand the nature and limitations of the stocks used for the foundations of their trees. With but few exceptions Australian nurserymen have exclusively used the wild lemon as a stock, while citrus growers in other countries, such as California, Florida, Algeria, as well as European growers, give preference generally to the sour orange as a stock. Seedlings from the sweet orange, Otaheite, Trifoliata, and Pomelo have also been tried, but have not come into favour, with the exception of the first mentioned, owing to their limitations or unsuitability.

In the selection of citrus trees the adaptation of the stock to soils and climatic changes, and the reciprocal influence between stock and scion should not be overlooked. It cannot be denied that such an influence is exerted in the direction of hardiness, rate of growth, shape of the tree-head, as well as the quality of the fruit produced.

Sour Orange Stock.

In point of hardiness the sour orange (*Citrus vulgaris*) is considered to be much superior to the wild lemon (*Citrus limonum*). At the Wahgunyah nursery last winter, when the temperature fell below 22 deg. Fah., no appreciable damage was done to the one-year-old bed of sour orange stock, while the lemon stocks were frosted back to the crown. The sour orange stock has an abundant root system, which penetrates well into the soil. In this respect it has a considerable advantage over many other stocks as the roots are not subjected to the same variations of temperature as those of a more shallow rooting habit, nor are they so liable to suffer injury from the plough during cultivation. In this deep rooting habit the trees have a larger area from which to derive the plant food of the soil as well as their roots being in contact with a more or less permanent water supply.

Collar-rot (*mal-di-goma*) is one of the most serious troubles of the orange grove, as, working insiduously on the trunk beneath the surface, the disease involves the ruin of the tree before the grower is aware of its presence, and too late for any remedial measures being taken. By the death of numerous trees here and there throughout the grove, the grower in a few years finds the orchard unprofitable, but by the use of the sour orange stock this condition can be avoided as the sour orange is not subject to this particular disease.

Trees worked on the sour orange require not only plenty of moisture but also rich soils in humus. On the poorer and drier class of soils they do not grow so large as those worked on the wild lemon. In general, the sour orange stock is most suitable for our irrigation areas, where plenty of moisture can be supplied, and the fertility of the soil maintained. From the first time of cropping the fruit borne by trees worked on the sour orange is of good quality, being thin-skinned, juicy, and showing little "rag." They are somewhat shy in bearing at first, but with age they fruit well, and the trees under suitable conditions are long lived.

Wild or Rough Lemon Stock.

The wild lemon is a rapid grower, but is more susceptible to injury by cold than the sour orange. Trees worked on this stock outgrow those of almost any other stock in use, and they fruit early and abundantly, though the fruit at first borne is generally thick-skinned, and lacking in juice. The root system varies widely from shallow to a satisfactory depth, and owing to its wide range of foraging, trees worked on this stock are suitable for the drier and less fertile areas. It has been the experience of some growers in this State that the trees on this stock are relatively short-lived when compared with those on the sour orange. Owing to the rapid growth of the lemon seedlings, trees can be raised on this much more readily than on other stocks. Lemon-stock trees should not be planted out on heavy, wet soils, or where they may be subject to hardships due to lack of drainage, even on the lighter soils.

Rough Lemon Stock Budded; Seed Sown September, 1915. State Nursery, Wahgunyah.

At the Wahgunyah citrus nursery the Department of Agriculture has a limited number of Washington Navels, Valencia Late, Eureka and Lisbon lemons worked on the sour orange stock for disposal during the coming season at £6 per 100 f.o.r. Wahgunyah. In addition, there are something like 5,000 lemons (Eureka and Lisbon) worked on the wild lemon stock, which are available at the same rate. Those desirous of securing these trees must lose no time in making application, as already orders are being received for trees of this character. A charge of 10s. per 100 is made on application, and the balance of £5 10s. per 100 when directions are given to have the consignments forwarded. Intending purchasers are requested to make application for citrus trees on the official form, which will be forwarded immediately on application for same.

It is expected that this year there will be a fairly large quantity of citrus trees available at the nurseries, as 28,000 stocks have been

budded this season, and, in addition, 34,000 stocks have been planted cut. The stock consist of the two varieties commonly used, viz., the wild lemon and the sour orange, so that growers may have their choice as regards the stocks on which their trees are worked.

Planting.

When the trees are received from the nursery they should immediately be unpacked and "healed" in. This is done by digging a shallow trench and placing the trees singly therein, covering the roots well with soil and thoroughly wetting them.

When planting, which should be carried out as soon as possible, just a sufficient number to handle expeditiously should be taken from the trench and the tips of all the larger roots cut off by a clean under

Sour Orange Stock ready for Budding; Seed Sown October, 1914. State Nursery, Wahgunyah.

cut, while most of the fibrous roots should be removed and if at all dry they should be completely cut away.

The holes for the reception of trees require to be dug at the time of planting in order that the soil moisture may be retained, or, if these have been opened up previously, it will be necessary to cut away 3 or 4 inches of the edges that have set somewhat and would therefore resist the extension of the roots later on.

The trees need to be planted at the same depth they occupied in the nursery, the soil being carefully filled in while the roots are spread out on the surface thereof as it reaches their level.

When the hole has been about three parts filled up water should be freely added so as to bring the soil particles in close contact with the roots and to facilitate the capillarity of the permanent soil moisture. The remaining soil should be then filled in and left in a loose condition to act as a mulch. The trees require irrigating every ten days during the first season. Immediately after planting it will be

necessary to cut the heads of the trees hard back to correspond to the reduction of the root system due to the lifting. If this is not carried out the transpiration that is going on through the leaves exhausts the trees before root action can take place, and causes the death of the trees. If after cutting back any signs of dryness appear further reduction of the top will be necessary. The failure to reduce the top at planting is one of the greatest contributing factors to the losses that growers have recently sustained when handling their young trees. At Wahgunyah nursery some very large trees received from America were planted out in accordance with the above directions without the loss of a single one, though they had been many weeks in transit.

HOME-MADE SHEEP DIP.

By F. R. Temple, Inspector of Stock.

Though numerous sheep-farmers prepare their own chemical solutions for the destruction of animal parasites in their flocks, it is questionable whether their doing so is really economical. Roughly speaking, the cost of a standard dipping compound prepared with chemical exactness and expert knowledge of what is most destructive to parasites and their eggs, and least harmful to the animals treated, is less than a halfpenny per head.

However, many will still prefer to make up their dip themselves, and my present object is to draw attention to the danger of persons carrying out this work without some knowledge of the chemicals they are dealing with. The fact that arsenic—the basis of most poison sheep dips—is on the market in three grades, viz., pure, commercial, and low grade, should be emphasized.

Arsenic is produced in various places in Victoria, being a by-product saved in the treatment of what is generally known as pyrites, and prior to the war a great deal of our arsenic was purchased for Germany.

From my own personal knowledge of the business of manufacturing arsenic I can say that some makers produce a compound containing 98 per cent. of arsenious acid, while that prepared by others is of a much lower grade. Herein lies the necessity for precaution. Makers of their own dipping fluid using arsenic should ascertain its strength and prepare a formula for their guidance. It might be that they would form their bases on, say, an assumed 80 per cent. arsenic content when in reality the material used might, perhaps, contain 98 per cent. arsenious acid, and consequently would require a more alkaline matter to provide the necessary solution, otherwise a quantity of free arsenic would remain in the mixture, which would be injurious to the sheep.

Though I have mentioned only two of the component parts of most poison dip preparations, it is, of course, not suggested that these are the only chemicals whose use requires technical knowledge in order to secure their full benefit.

To state the case in a few words—It does not pay to be one's own "dip maker" without sufficient knowledge of chemistry for working out quantities.

POWER-ALCOHOL.

A Substitute for Petrol.

The dependence of Australia on other countries for her supply of mineral oils suitable for internal combustion engines is a matter to which attention has been directed for several years. The price of petrol has increased from 1s. per gallon in 1908 to 3s. 2d. at the present time. So far we have been able to secure a supply of mineral oils sufficient to meet our needs, but in view of the increasing shortage of shipping and the large demands for petrol in connexion with the war, we may at any time be thrown on our own resources for supplies of liquid fuel. In 1916-17 Australia imported nearly 20,250,000 gallons of petrol in addition to 22,000,000 gallons of kerosene. The supplies of petrol are finite, and in view of the gradual exhaustion of the old-fields the probability that the price of mineral oils will fall substantially is stated to be remote.

In Australia conditions are eminently favorable for the growth of crops containing sugar and starch, from which alcohol can be manufactured. Alcohol is in every way suitable for use as a liquid fuel. Indeed, it possesses certain distinct advantages over petrol. The main advantage is that, owing to the greater degree of compression that can be used with alcohol without danger of pre-ignition, a much higher efficiency can be attained in a properly-designed alcohol engine than in a petrol engine. The result is that the cost of fuel in an efficient alcohol engine, with spirit at its present price of 2s. 6d. per gallon, is only 3d. per horse-power hour, compared with 3½d. in a petrol engine, with petrol at 3s. 2d. a gallon.

The whole question of the production and utilization of alcohol for power purposes in Australia is being investigated by a Special Committee appointed by the Commonwealth Advisory Council of Science and Industry, consisting of Professor Lyle (chairman), Messrs. W. R. Grimwade, W. N. Kernot, H. V. McKay, and G. Lightfoot (secretary), and a comprehensive and valuable report, reviewing the whole situation and giving the results of investigations so far made, has been issued. The whole question divides itself into three main problems, viz.: (*a*) the production, (*b*) the utilization, and (*c*) the denaturation of the alcohol. The last-named refers, of course, to the mixing of the spirit with some other material so as to render it unfit for drinking.

As regards the production of power-alcohol, the most suitable raw material is the sugar molasses now wasted in Queensland. But even if the total annual quantity of molasses wasted and used for purposes other than distillation (47,500 tons) were used for the purpose in view, it would only be sufficient to manufacture about 3,125,000 gallons of alcohol, whereas the annual petrol requirements of Queensland alone are nearly 3,500,000 gallons. Moreover, owing to freight charges and labour costs, it does not seem feasible to regard molasses in some of the outlying northern parts of Queensland as a profitable source of liquid fuel for use in parts of Australia far distant from that State. For these reasons, it is necessary to consider whether some other profitable source of supply cannot be found.

The most important desiderata in connexion with raw material for the manufacture of power-alcohol are—(*a*) Constancy and abundance of supply; (*b*) accessibility of supply; (*c*) price; (*d*) percentage of sugars or starches.

For one or more of these reasons, certain materials, such as wheat, waste fruit, barley, potatoes, and prickly pear, are at once ruled out of court as suitable raw materials for the manufacture of alcohol in Australia. On the other hand, certain materials, such as sorghum (sweet) stalks, cassava, and sorghum grain, offer favorable opportunities as a source of alcohol, and if some stimulus or inducement were offered for the manufacture of power-alcohol it appears that there is a favorable opportunity for the establishment on a large scale of a new and important industry in the Commonwealth. A large amount of information regarding various raw materials is given in the report. Of the native plants, the only two worthy of serious consideration as a source for the manufacture of alcohol are the Zamia palm (Macrozamia) and the grass-tree (Xanthorrhœa).

Government regulation of the process of manufacture of alcohol—under the Commonwealth Distillation and Spirits Acts—is necessary to protect the Excise revenue, but such regulation results in an increase in the price of alcohol estimated at about 5d. per gallon. Of that sum, about 3d. is due to the extra cost caused by fiscal restrictions on the manufacture of the spirit, the remaining 2d. being the cost of methylation or denaturation now required for industrial spirits under the *Spirits Act* 1906.

As the margin of profit between the price of power-alcohol and that of petrol is at present small, having regard to the comparative costs of the fuels per horse-power hour, a sum of 5d. per gallon may make all the difference between profit and loss, and in attracting the necessary capital for the establishment of an industry of national urgency and importance.

The Committee have considered the question of methylation, and, as the result of their experiments, have concluded that the distillates obtained from coal tar oil at a temperature of from 170° C. to 230° C. fulfil the conditions necessary for an ideal denaturant better than the denaturants at present in use. Moreover, the cost of such distillates is less than the cost of alcohol, and if they were used as a denaturant they would accordingly cheapen the cost per gallon of denatured power-alcohol, whereas the materials now used for the methylation of "industrial spirits" result in an increase in price.

The Committee accordingly recommends that, in order to develop the use of alcohol for power purposes, and to encourage the production of the raw material upon which the manufacture of power-alcohol depends—

1. The manufacture and use in Australia should be permitted of "power-alcohol," denatured with 2 per cent. of these distillates.
2. That an allowance at the rate of 3d. per gallon be granted by the Commonwealth Government on "power-alcohol" denatured in the above manner and manufactured in Australia from raw materials produced in Australia, by way of reimbursement of the extra cost caused by fiscal restrictions on the manufacture of alcohol.
3. That a bonus, also at the rate of 3d. per gallon, be granted by the Commonwealth Government on such "power-alcohol," in order to encourage its manufacture and to develop the primary industries on which the supply of the necessary raw material depends.

The question of the utilization of power-alcohol as a fuel for internal combustion engines will be dealt with in a later article. Copies of the report may be had gratis on application to the Secretary, Advisory Council of Science and Industry, 314 Albert-street, East Melbourne.

WHEAT STORAGE PROBLEMS.

Protection from Weevils.

The problems affecting wheat storage, or as it might be more accurately described, wheat preservation, are of extreme urgency in view of the prospect of a serious shortage in the food supply of the world as one of the results of the war, and it is obviously a matter of exceptional importance to prevent, as far as possible, the destruction and loss of grain in store through the ravages of pests.

Recognising this the British Government asked the Royal Society of London to arrange an investigation into the damage done by insects to grain in store throughout the Empire.

The Executive Committee of the Commonwealth Advisory Council of Science and Industry received, through the Prime Minister's Department, in October, 1916, a request from the Royal Society that a committee should be appointed in Australia to co-operate with similar committees in England and Canada in this investigation. Reports were obtained from the Government Entomologists of each State, and it was shown that considerable losses were caused annually in Australia from grain weevils and other pests. The Executive Committee thereupon appointed a special committee to make further investigations.

This special committee included Mr. Leo Rossell, representing the milling industry: Professor W. A. Haswell, F.R.S., Professor of Zoology in the University of Sydney; and Mr. W. W. Froggatt, Government Entomologist, New South Wales. Mr. F. B. Guthrie, chemist to the Department of Agriculture of New South Wales, subsequently joined the committee. The progress report prepared by this special committee has now been published in Bulletin 5 of the Advisory Council, and can be obtained post free from the Secretary, 314 Albert-street, East Melbourne. The report indicates that only the two grain weevils (*Calandra granaria* and *C. oryzae*) demand special measures on account of their destructive effects on stored grain, that the development of weevils in wheat and their increase in number may be checked by not using old bags which may be weevil-infested or storing in buildings likewise infested, and that bags of weevil-infested wheat should not be brought into contact or near that which is sound, for before wheat can become infested there must be a female to lay her aggs in the grains of wheat. It is only when the perfect insect, after going through the various stages of its larval existence, emerges through a tiny hole in the grain that the damage is evident, and, except during the pupating state, destruction is going on during the whole life of the insect. Under suitable conditions it takes from nineteen to twenty-two days from the egg to the adult beetle, and in three months in one experiment forty weevils produced 3,056 descendants. Under the present system of handling wheat the destruction of weevil, once it has gained access to the bagged grain, seems hopeless; many methods of fumigating grain have been tried, and so far the most effective is that of poisoning with the fumes of carbon dioxide, but with bagged wheat this is not applicable save at a prohibitive cost. Sun-dried wheat contains only 4.7 per cent. of moisture.

Neither in this, nor in wheat as it emerges from the thresher with a moisture content up to 6.7 per cent. will weevil breed. With 8 per cent. of moisture they died in six weeks without breeding; at 9 per cent. they remained dormant, but with anything above the latter, provided they had free air, they became active and bred. It would thus appear that dry wheat stored in air-tight bins is immune from the attack of weevils. Wheat when first bagged does not, under ordinary circumstances, contain sufficient moisture to enable weevils to breed, therefore, *unless moisture is added from without*, the grain remains weevil proof. Thus if stored in a fairly dry climate, completely protected from the weather, it is certain that wheat may be stored for an indefinite period without any damage from weevil.

Treatment of Damaged Grain.

The serious plague of mice which occurred last season in New South Wales, Victoria, and South Australia resulted in considerable damage to the wheat stored at inland centres. Whilst a certain proportion of the wheat was devoured by the rodents a considerable quantity was damaged or tainted. Some stored wheat was also damaged owing to rain and the attacks of weevils.

The problem therefore arose as to the best method for treating such damaged grain to prevent further deterioration, and, if possible, to purify it so that it could be utilized for food purposes. In July, 1917, the Executive Committee of the Commonwealth Advisory Council of Science and Industry had an interview with Mr. A. O. Barrett, who has had considerable experience with grain in bag stacks, and he outlined a scheme whereby wheat should be stored in special silos after mixing with quicklime. He claimed that this lime-treatment has the following advantages:—(1) It dries ordinary f.a.q. wheat, thus rendering it less liable to attacks of weevils and at the same time improving its milling qualities; (2) it destroys the smell of mouse tainted or smutty wheat, and sterilizes the outside of the grain; (3) it removes the smell of damp, musty wheat, and arrests further deterioration by fungus pests; (4) it inhibits the growth of weevils in wheat already infested and prevents them from developing. These statements were supported by the exhibition of samples of damaged wheat which had been purified in the manner indicated, on a laboratory scale.

The Executive Committee thereupon appointed Professor D. Orme Masson, F.R.S., Professor of Chemistry; Dr. W. Heber Green, Lecturer in Agricultural Chemistry; and Dr. W. J. Bull, Lecturer in Bacteriology in the University of Melbourne, together with Professor T. R. Lyle, F.R.S., to carry out tests of the effects of quicklime on damaged grain on a larger scale, and gratefully accepted Mr. Barrett's offer to allow experiments to be undertaken at the firm's maltings at Richmond. The report on these experiments forms the main part of Bulletin No. 5, recently issued by the Advisory Council of Science and Industry.

Various samples of wheat, including (1) good, (2) weevily, (3) tainted, (4) damp and damaged, (5) mousey, were treated first by passing each lot through a small sized Eureka wheat cleaning machine. The cleaned wheat was then weighed and mixed with 1 per cent. of its weight of quicklime, then stored for about fourteen days. The good wheat f.a.q. (Federation type) parted with a considerable amount of moisture, and the general effect was that the addition of quicklime to sound grain is in no way harmful, and may be expected to produce some slight improvement. All weevils in the adult stage, and practically all grain attacked, were removed upon screening the weevily wheat, but the

weevils were not killed. It is only by adding lime at a high temperature under the conditions of Mr. Barrett's scheme that this is effected. The tainted wheat lost nearly 20 per cent. upon being screened, and the pronounced mousey and musty odour was considerably reduced, but before the work of the lime could be completed it would require to be applied fresh and hot, and left in contact for some months. The damp wheat, although not so bad as the previous wheat, was yet incapable of being converted into a wholesome article, though the lime had materially reduced the smell and bacteria present. The mousey wheat was treated with freshly ignited lime, and the results proved very satisfactory, showing conclusively that the lime, to be effective, must be applied hot. The bacteriological and chemical examinations made of the lime treated wheat clearly indicate that considerable improvement has been effected.

The bulletin which gives full details of these experiments may be obtained post free from the secretary of the Advisory Council, 314 Albert-street, East Melbourne.

BACTERIAL TOXINS IN SOILS.*

By R. Greig-Smith, D.Sc., Macleay Bacteriologist to the Linnean Society of New South Wales.

If the soil-water is considered as a medium for the growth of bacteria, it should contain not only the nutrients that favour bacterial growth but also the waste products of their vital activity. And if we reason from what we know about the growth of bacteria in other media, we should expect that some of these waste products are injurious to the bacteria producing them. Furthermore, in a mixed flora, certain groups should produce injurious substances in greater amount, and these should differ in degree in their action upon bacteria of their own group or of other groups. For convenience, these injurious substances are called toxins. Certain investigators deny the presence of toxins in soils, although they admit the presence of inhibiting substances. It is difficult to account for the discrimination.

The multiplication of bacteria in the soil will, among other conditions depend upon the relative preponderance of the nutrients over the toxins; and, with the other conditions remaining constant, an ultimate equilibrium should be established between the nutritive and the toxic effects. An alteration of the other conditions will disturb the equilibrium, and the bacteria will increase or decrease until another balance is established.

Russell and his colleagues believed that the bacterial increase in soils was limited by phagocytic protozoa, and more recently they consider that the limitation is occasioned by a something associated with the presence of a mixed living fauna. Any treatment which destroys the diversity of the fauna and at the same time kills off the nitrifying organisms will insure an increased and sustained growth of bacteria.

* Excerpt from a paper read before the Agriculture section of the British Association for the Advancement of Science at its Australian meeting 1914.

Such treatment is sufficiently drastic to completely alter the bacterial flora and the relations between the groups of bacteria; some will be destroyed, while others will be unaffected. Those groups which ammonify organic nitrogen are little affected, while the nitrifying bacteria, according to the recent work of Gainey, are only temporarily disabled.

In demonstrating the presence of bacterial toxins in soils, I have made use of aqueous extracts of soils which, after filtering through porous porcelain have been seeded with known quantities of bacteria. Generally, *Bac. prodigiosus* has been employed as a test organism. It is more sensitive than mixtures of soil bacteria, and is easily grown, detected and counted. Tests have shown that extracts which destroy *Bac. prodigiosus* retard the growth of mixed soil-bacteria. We are justified in considering that an extract which destroys *Bac. prodigiosus* is also capable of destroying some of the soil-bacteria.

The bacterial toxins are not always easily demonstrated, as they are frequently overshadowed by the soil-nutrients, but investigation has pointed out some of the conditions under which they may not be expected to show a direct action in soil-extracts. For example, they are destroyed by exposing the soil to the sun, by heating the soil, by storing the soil in the air-dry condition; they decay rapidly in aqueous solution, and are destroyed upon boiling. They are soluble in water and are washed out of the soil by rain. Direct evidence of their presence should not, therefore, be expected in arid soils, in soils during a drought, or in soils after rain. Much of the so-called fertilizing effect of the sun may be due to the destruction of the soil-toxins. Indirect evidence of their presence is easily obtained by boiling the soil-extract, seeding it with bacteria, and comparing the growth with that obtained in the unboiled extract. A greatly increased growth of bacteria is usually obtained in the boiled extract. A direct diminution is only obtained under certain conditions. These have not been fully investigated, but enough has been done to show that one of these depends upon the ratio of the soil to the water used for extraction. Equal parts of soil and water—that is, 100 grams of soil and 100 c.c. of water—generally give the maximum toxic effect.

The toxic effect is not evident after rain, but becomes pronounced after a few days of dry weather. Similarly, a soil which has been extracted with water, and found to be toxic, will, upon further extraction, give a nutritive extract. If the same soil, after extraction, be incubated at 22 degrees for some time, and then extracted with water, the extract will be found to be toxic. Thus toxins are developed upon incubating a nutritive soil.

While the extracts of soils show an enhanced nutritive effect after boiling, those of the subsoil become more toxic. It appears, therefore, that there are at least two kinds of toxins in soils—one, predominating in the soil, is thermolabile; the other, predominating in the subsoil, is thermostable.

The action of the volatile antiseptics upon soils is to so alter them that, while before treatment they yielded extracts directly bacteriotoxic, after treatment the extracts became nutritive. Thus the partial sterilization of soils, whether by heat or by volatile antiseptics, causes them to give extracts, in which there can develop a greater number of bacteria.

DISTRICT RAINFALL IN VICTORIA, 1917.

District.	—	July.	Aug.	Sept.	Oct.	Nov.	Dec.
Mallee North ..	District Mean ..	179	288	259	267	276	55
	Average ..	93	109	135	116	78	83
	Per cent. departure	+ 92	+164	+ 92	+130	+254	— 34
Mallee South ..	District Mean ..	181	271	282	288	208	23
	Average ..	121	135	154	112	94	97
	Per cent. departure	+ 50	+101	+ 83	+157	+121	— 76
North Wimmera ..	District Mean ..	329	266	277	276	79	56
	Average ..	156	175	180	149	109	101
	Per cent. departure	+111	+ 52	+ 54	+ 85	— 28	— 45
South Wimmera ..	District Mean ..	373	239	314	309	108	73
	Average ..	209	219	221	183	131	118
	Per cent. departure	+ 79	+ 9	+ 42	+ 69	— 18	— 38
Lower Northern Country	District Mean ..	289	353	307	347	192	36
	Average ..	158	166	167	137	117	108
	Per cent. departure	+ 83	+113	+ 84	+153	+ 64	— 67
Upper Northern Country	District Mean ..	342	372	336	435	216	70
	Average ..	187	198	201	179	138	133
	Per cent. departure	+ 83	+ 88	+ 67	+143	+157	— 47
Lower North-East ..	District Mean ..	637	430	477	745	451	187
	Average ..	300	269	264	250	199	194
	Per cent. departure	+112	+ 60	+ 81	+198	+127	— 4
Upper North-East ..	District Mean ..	945	766	775	1.153	441	232
	Average ..	514	474	492	392	336	311
	Per cent. departure	+ 84	+ 62	+ 58	+194	+ 31	— 25
East Gippsland ..	District Mean ..	118	143	279	298	313	308
	Average ..	238	207	285	292	228	261
	Per cent. departure	— 50	— 31	— 2	+ 2	+ 37	+ 18
West Gippsland ..	District Mean ..	450	248	345	504	239	232
	Average ..	285	307	369	328	271	279
	Per cent. departure	+ 58	— 19	— 7	+ 54	— 12	— 17
East Central ..	District Mean ..	335	382	423	511	296	233
	Average ..	281	285	342	319	273	281
	Per cent. departure	+ 19	+ 34	+ 24	+ 60	+ 8	— 17
West Central ..	District Mean ..	191	284	294	349	222	146
	Average ..	198	204	280	215	182	173
	Per cent. departure	— 4	+ 39	+ 5	+ 62	+ 22	— 16
North Central ..	District Mean ..	402	471	460	445	243	143
	Average ..	256	266	280	231	199	183
	Pet cent. departure	+ 57	+ 77	+ 64	+ 93	+ 22	— 22
Volcanic Plains ..	District Mean ..	321	311	304	355	214	127
	Average ..	219	229	284	219	180	162
	Per cent. departure	+ 47	+ 36	+ 7	+ 62	+ 19	— 22
West Coast	District Mean ..	534	319	372	474	255	75
	Average ..	325	319	328	262	205	184
	Per cent. departure	+ 64	..	+ 13	+81	+ 24	— 59

H. A. Hunt, Commonwealth Meteorologist.

THE STABLED HORSE.

Some Vices and Whims.

Many horses have the habit of rolling in the stable. This is somewhat dangerous for the horse, as he is likely to get fast, particularly if his stall is rather narrow. When the horse attempts to roll and stays over on his back the stall is too narrow for him to go on over, so he cannot get up, and as it is often impossible for him to roll back, he gets fast. The longer he struggles while lying on his back the worse his condition becomes. This habit is due, perhaps, to lack of opportunity to roll.

The horse should be turned to a paddock for a few minutes each evening, so that he may frolic. To overcome the habit, secure a small ring and set it in the top of the halter. Suspend a small rope from a beam or the ceiling so that it will hang directely over the horse's shoulders when standing at the manger. Attach a snap to the lower end of the rope and snap into the ring at the top of the halter. This rope should be of sufficient length to allow the horse to get his nose to the ground about where his front feet usually stand. This appliance will permit the horse to lie down, get up, and do as much as he likes, but he cannot place the top of his head to the ground. As he cannot roll without first placing the top of his head on the ground, this is a very efficient arrangement for overcoming the habit.

Pawing with the Fore-feet.

This is a disagreeable habit, usually due to insufficient exercise or to restlessness when the animal is left alone in the stable. It causes useless fatigue and a rapid wearing out of the shoes. The noise that the horse makes while pawing is almost unbearable, especially at night. To avoid the habit exercise the horse regularly. To overcome it, buckle a leg strap around the foreleg just above the knee, and from it suspend a block of wood about two inches square and four inches long, so that it will hang about the middle of the cannon.

When the horse attempts to paw, the block strikes him. In case the horse is very sensitive, substitute a corncob for the block. Another good plan is to use a heavy strap provided with a buckle at either end and buckle the two forelegs together. This strap should be of the proper length to permit the horse to stand normally. With this appliance he can lie down, get up, move backward and forward, but is unable to paw. Some horses that paw badly in a common stall will cease if placed in a box stall, particularly if bedded with sawdust.

Rubbing the Tail.

Many horses acquire the habit of rubbing the tail against the sides of the stall or other surrounding objects. This is very undesirable, as the hairs soon become tangled, break off, and disfigure the tail. While there may be several causes for it, the principal ones are intestinal troubles, mange or unclean skin, causing intense itching, and infirmities

of temper. To overcome the habit the treatment will vary according to the cause. If due to intestinal worms they must be removed, when the horse will cease to rub his tail; if due to mange or dirty skin, the disease must be cured and the skin kept clean; whereas, if due to temper other means must be employed.

Chewing Tie-Strap.

Occasionally the horse contracts the habit of chewing his tie-strap. It is probably due to the salty taste of the leather, as he usually begins by licking and finally takes to chewing the strap. To overcome the habit some horsemen recommend to keep rock salt before the horse for him to lick, although the best plan seems to be that of substituting a chain for the leather strap.

Gorging Grain.

Many horses have the disagreeable habit of gorging their grain and swallowing it without mastication. This may result in fatal colic. To overcome the habit give the horse a drink and feed some hay before feeding the grain. Another very good plan is to feed the grain in a rather large, flat-bottomed grain box provided with pockets, as this arrangement prevents the horse from getting much grain at a mouthful. Some horsemen recommend placing round stones in the grain box, but the confirmed grain gorger is usually an adept at throwing stones out before eating the grain.

—*Town and Country Journal.*

A NEW MAIZE SECRET.

Interesting Developments.

Reports to hand by the last American mail announce an interesting development in maize-growing experiments. Certain tests have been conducted by officers of the School of Agriculture of the University of Minnesota. If future tests sustain the present indications, every bushel of maize planted may be made to send up more sprouts, and these sprouts may grow so fast that several weeks may be gained in the maturing time of the corn. Scientists at the Minnesota University Farm believe that they have discovered, quite by accident, a commercially practicable method of increasing the germination rate of seed maize. It came about in experimenting with various insecticides to be used in treating grains.

Professor Wm. Moore, of the Entomology Department, and Professor H. K. Hayes, of the Agronomy Department, have been working on fumigation processes for killing grain parasites. It is important

that germination qualities of grain treated should not be impaired in fumigating, so they regularly checked plantings of the untreated. It was in connexion with the use of nitro benzine that they bumped into the unexpected. They found that not only was the grain not impaired for seed purposes, but that it was actually bettered. Maize seemed to thrive on the fumes of nitro benzine. Not only was the percentage of germination increased by treatment, but the rate of germination also speeded up. The experimenters checked and re-checked again and again, with the same results. An experiment with 1911 maize, for instance, brought out the fact that the fumigated seeds sprouted nearly two days before the unfumigated, when planted at the same time, and of the former about 18 per cent. more kernels germinated than of the latter.

"We are not saying that the treatment will so result with all corn," Professor Moore said, "as our experiments have not gone far enough to justify so sweeping a statement, but we expect to wind up the most significant test of all on the subject shortly, after which we shall have something to announce. Nitro benzine is an oil, a coal tar derivative. Its price has been raised somewhat by war causes, but it is commercially obtainable. We fumigate the corn by placing it in a closed box in which is suspended a cloth saturated with the oil. The fumes do the work. We think well enough of present indications to make known our findings at this time, so that American farmers who are facing a critical seed maize situation may try out the process if they see fit. Why does the treatment so affect the corn? We haven't the slightest idea. We only know that it has had that effect with corn we have treated."—*Farmers' Union Advocate*, 17/3/17.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Pomologist.

The Orchard.

Young Trees.

Young trees of the Citrus family should now be making a good, thrifty growth. The foliage should be glossy, and its general appearance a bright green and healthy one. Occasional light waterings, as well as mulching of grass, or of well-rotted manure, will be helpful to the trees.

Young deciduous fruit trees will also benefit by having a grass or manure mulch; and, if it has not previously been attended to, unnecessary growths in the centre of the tree and on the main leaders should be removed.

Fumigation.

Evergreen trees, including those of the citrus family, that are infested with scale, should now be sprayed or fumigated to rid the trees of this

pest. For spraying, a weak read oil emulsion, lime and sulphur spray, or resin wash will be found useful for the purpose. The most successful method, however, of dealing with the scale pest is by fumigation. The trees should be closely enveloped in an airtight sheet or tent, and hydrocyanic gas generated inside. The chemicals for generating the gas, as well as the fumes of the gas itself, are excessively dangerous, and great care is necessary in their manipulation. A wooden, enamel, or earthernware vessel is placed inside the tent, the vessel containing a mixture of 4 fluid ounces of sulphuric acid, and 12 fluid ounces of water, the acid being placed in the vessel first. Four ounces of cyanide of potassium is then quickly dropped into the vessel, the tent closed down at once, and the bottom of the tent all round covered with soil to prevent any of the gas escaping. The operator must take care that not the slightest portion of the fumes is breathed. Fumigation should be carried out at night-time or on a cloudy day, if the foliage of the trees be thoroughly dry.

Pomological Notes.

The Ettersburg Strawberry.—This is the so-called "tree" strawberry that was freely advertised last season, and sold at 1s. per plant. It is certainly not a "tree" strawberry—that name is quite a misnomer, and the term "bush" strawberry would certainly have been a better one.

The foliage has grown very vigorously, the leaves are strong, and altogether it may be described as an exceedingly robust and vigorous grower. The "tree" habit, which has been ascribed to the plant, occurs in the form of strong, rather long, and upright flowering stems, which throw the flowers far above the foliage, and taller than any other strawberry so far grown here. Both the main stalk and the individual stems are long, and the flowers are usually well developed.

The first crop of fruit was not generally good, the second being heavier. The berries of the earlier crop were the larger. But neither the early nor the late crop produced berries of large dessert size, although the plants were grown under favorable conditions. The second crop quantity was good; the berries were well coloured, firm, and very well flavoured. So that, judging from the first season's results, it would seem that the Ettersburgh strawberry will fill the requirements as a jam factory berry, being sweet, solid, and prolific, but it has not yet proved itself worthy of being placed on the list of strawberries grown for dessert or table.

It would be well if the term "tree" were abandoned in favour of a more descriptive name.

American Apples.—American apples are now being sold in the shops. Jonathans are rather under Australian export size, but that is rather an advantage to the buyer than otherwise. They are exceptionally well coloured, and, while a certain amount of expected mealiness is present, the flavour is very fair, considering the long journey from Canada, and the extended cool storage conditions.

The Esopus Spitzenbergs are very highly coloured, and are perhaps the best flavoured of all the varieties so far to hand.

The Winesaps are well coloured, and juicy, but the fine, sweet vinous flavour of this variety has gone, possibly owing to the long keeping.

The apple American Beauty is not much known here. It is highly coloured, having a large number of prominent russet and grey dots on the skin. In that respect, it somewhat resembles a highly coloured Rome Beauty, but it is more oval in shape. The flesh is white, firm, and juicy, and the flavour somewhat sub-acid. Hedrick, in "The Apples of New York," says that this apple has almost gone out of cultivation in that State. In view of this, and also its sub-acid flavour, it is not an apple to be commended for Australian growers.

Vegetable Garden.

Celery crops will now be a prominent feature in the vegetable section. The seed may be sown from January to March, and succession plantings should be carried out occasionally during those months. The growth of celery should be quick; a fair supply of water and a good rich, loose soil are helpful to its growth.

Ample water will now be required in the vegetable garden. The surface should be kept well hoed, and mulchings of manure given wherever possible.

Cabbage, carrot, turnip, radish, lettuce, peas, cauliflower, &c., seeds may now all be sown, and young plants from any seed beds planted out.

Flower Garden.

Constant watering and hoeing will now be required for successful gardening. Cannas will require manuring; the old flowering stem should be removed to make way for the new growths. Dahlias and chrysanthemums will need a great deal of attention, staking the growths as they devlop, disbudding, thinning out weak shoots, and removing unnecessary growths. The dahlias should receive a good soaking of water during the hot weather, and liquid manure or quick acting fertilizers given when the flower buds are developing. When chrysanthemum buds are very small, liquid manure should be applied. Roses may now be summer pruned; all weak growths should be removed, and the strong ones shortened to a fairly good bud. The plants should then receive occasional waterings with liquid manure, and be kept well supplied with water.

All flowering trees and shrubs that have finished blooming should be pruned, the flowering growths removed, and, unless the seed is required, all seed heads cut off.

Cuttings of pelargoniums, zonale and regal, may now be planted, delphinium spikes that have finished flowering cut down to make way for new growth, the plant being watered and manured. Seeds of perennial and hardy annual plants, especially winter-flowering sweet peas, Iceland poppies, stocks, and pansies, may now be sown, and a few bulbs for early flowering planted. The beds should be well manured and deeply worked in anticipation of planting the main crop of bulbs.

REMINDERS FOR MARCH.

LIVE STOCK.

HORSES.—Feed as advised last month. Those in poor condition should be "fed up" in anticipation of winter.

Should horses not be feeding well and salivating, examine mouth for grass seeds. Horses running at grass are frequently affected by them. The seeds should be removed, and a mild mouth wash used. A very weak solution of Condy's Fluid will answer the purpose.

Grass seeds also cause blindness if not removed from the eye, and the inflammation reduced by bathing the eye with boracic solution. A teaspoonful of boracic acid to a pint of boiling water is the correct strength for the purpose. Should a scum remain over the eye inject into the eye every other day a small quantity of the following solution:—Sulphate of zinc, 4 grains; water, 1 pint.

CATTLE.—Cows in milk should have plenty of succulent fodder and water easy of access. Algerian oats should be sown on suitable land for grazing off in the winter. Sow a mixture of oats, rye, and tares or peas for winter fodder or to fill silos. Only exceptional cows and those required for town milk supply should be served between now and July. Within the next two or three months is the best time for cows to calve, as they will pay to feed through the winter and give the best returns for the season, and be dried off when the grass is dry and scarce. Calves should be given lucerne hay or crushed oats where grass is not available.

PIGS.—Sows about to farrow should be provided with short bedding in well-ventilated sties. See that the pigs have shade, and water to wallow in. There should be plenty of cheap feed now, and pigs should be highly profitable.

SHEEP.—All ewes should be kept strong for lambing. Crutch round tails and lessen accumulation of discharge, and consequent attraction to the fly pest at lambing time. Clear wool from round udders and teats and thereby save many a lamb in bad weather; especially is this necessary in the case of young ewes of the Merino and Lincoln crosses. Clear wool from eyes also. In crutching ewes when close to lambing lay them over carefully, grasp by the thigh low down, not by the flank as is generally done. Pure British breeds of ewes and very coarse cross-breds may still be only coming in season; rams should be left mated to make sure. Clean excessive wool and stains from ewes, and burr and stains from rams to ensure service. Reserve good paddocks, if autumn be favorable, for ewes with early-born lambs. Castrate the ram lambs immediately. Good prices will be available for this class again this winter.

POULTRY.—Cull out the drones and get rid of surplus cockerels. Keep forward pullets well fed—eggs are rising in value. Repairs to houses should be done this month. Thoroughly cleanse all houses and pens. Spray ground and houses with a 5 per cent. solution of crude carbolic acid. This will act as a safeguard against chicken pox; burn all refuse and old feathers. Provide a liberal supply of green food. For each moulting hen, add a teapsoonful of linseed to the morning mash. Use tonic in mash, which should be kept in cool shady spot.

CULTIVATION.

FARM.—Work fallow where possible for autumn sowing of cereals. Sow winter fodder crops, such as rye, barley, and vetches. Prepare land for lucerne plots for autumn seeding. Make silage of maize and other crops for winter use.

ORCHARD.—Prepare new land for planting; plough deeply and subsoil; leave surface rough. Plant out strawberries after first rain. Plant crops for green manure. Continue to fight the Codlin Moth.

VEGETABLE GARDEN.—Prepare ground for winter crops. Plant out seedlings in moist soil. Sow cabbage, cauliflower, lettuce, early peas, swede turnip, beet, carrot, radish, and early onions.

FLOWER GARDEN.—Cultivate and water. Feed dahlias, chrysanthemums, and roses. Plant out shrubs, trees, and all kinds of bulbs. Sow hardy annuals. Plant geranium and pelargonium cuttings. Spray for Aphis, Red Spider, and Mildew.

VINEYARD.—Select scions, if not done last month. Where ripening is difficult, assist by removing basal leaves only, as soon as berries change colour. This is the month for drying currants, sultanas, and gordos (Lexias and Clusters). Do not pick before grapes are properly ripe. For instructions for packing grapes for export, apply to Department. Shipments should be made in March and early April.

Cellars.—Vintage month. For light dry wines, pick as soon as grapes are ripe; do not wait for over-maturity, as is so often done. Pay attention to acidity; correct same if necessary with tartaric acid or late grapes. Acidimeter supplied by Department; price, 3s. 6d. Sulphiting and the use of pure yeasts are strongly recommended, as they insure production of sound wine; further information supplied on application.

LIMESTONE SAND.

The hummocks environing the coast-line of the Western District from Allansford to Port Fairy consist of from 80 to 85 per cent. calcium carbonate, *i.e.*, mild lime. There are millions of tons available. Experiments at Warrnambool show remarkable results especially in the grazing areas. The effect of the sand, or at least the mild lime contained in the sand, is to increase the rate of nitrification and to intensify the growth of legumes. The immediate advantages are (*a*) a more succulent and richer pasture; (*b*) a marked increase in the carrying capacity; and (*c*) a longer growing period owing to maturity being retarded.

There is no doubt the limestone sand produces a marked effect, but, unfortunately, the dressing required is very large—from 20 to 40 tons were used in local experiments. This is the one disadvantage, for under present economic conditions the cost of a suitable dressing would amount to £5 per acre on land in the immediate vicinity of the hummocks, but local authorities claim that the rises in the value of the land more than meets this outlay.

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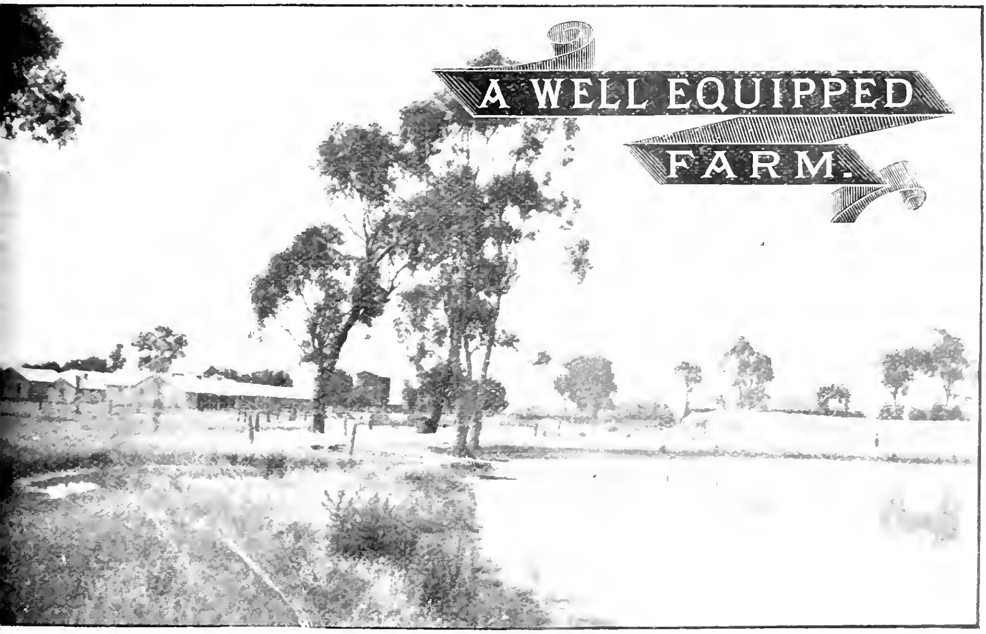

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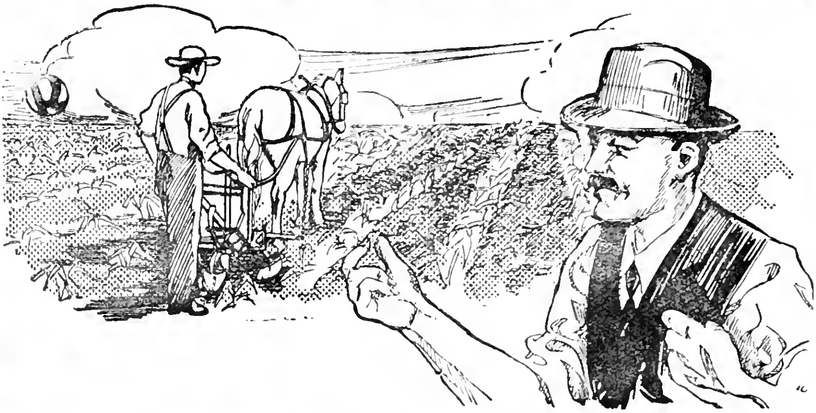

THE JOURNAL

OF

THE DEPARTMENT OF AGRICULTURE,

VICTORIA, AUSTRALIA.

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OF

VICTORIA.

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APPLE CULTURE IN VICTORIA.

By J. Farrell, Orchard Supervisor.

(Continued from page 88.)

Green Manuring.

Besides supplying plant food, green manure improves the physical condition of most soils, and particularly those deficient in humus. It has the effect of consolidating loose, sandy soil, and the soluble plant food is thus retained in the humus provided by the green manure instead of being washed out by heavy rains. The incorporation of vegetable matter in stiff clay soil causes its particles to separate, and this alters its physical condition to a more friable character.

Fertile soils teem with minute organisms or bacteria and these produce continual changes which have a beneficial influence on the growth of the trees. Bacterial activity is largely affected by the amount of organic matter present, the quantity of soil moisture, and temperature.

The intense soil cultivation, so essential to the growth and productivity of apple trees in this country, has the effect of exhausting rather quickly the supply of humus. Where stable manure is not procurable, crops for green manure should be grown between the trees and ploughed in to replenish the supply of humus. Leguminous plants such as peas, beans, vetches, &c., are most suitable for green manuring on account of their power of accumulating their own nitrogen. These plants are favorable to the growth of organisms, colonies of which develop in the nodules produced on their roots. These organisms collect nitrogen as they multiply in the nodules. The plants should not be ploughed under until they have arrived at the stage of having accumulated their maximum of cell sap. This condition usually occurs about the time the plants are in full bloom.

The field pea (*Pisum arvense*) is much used by our orchardists for green manure. The peas are usually sown broadcast, and lightly

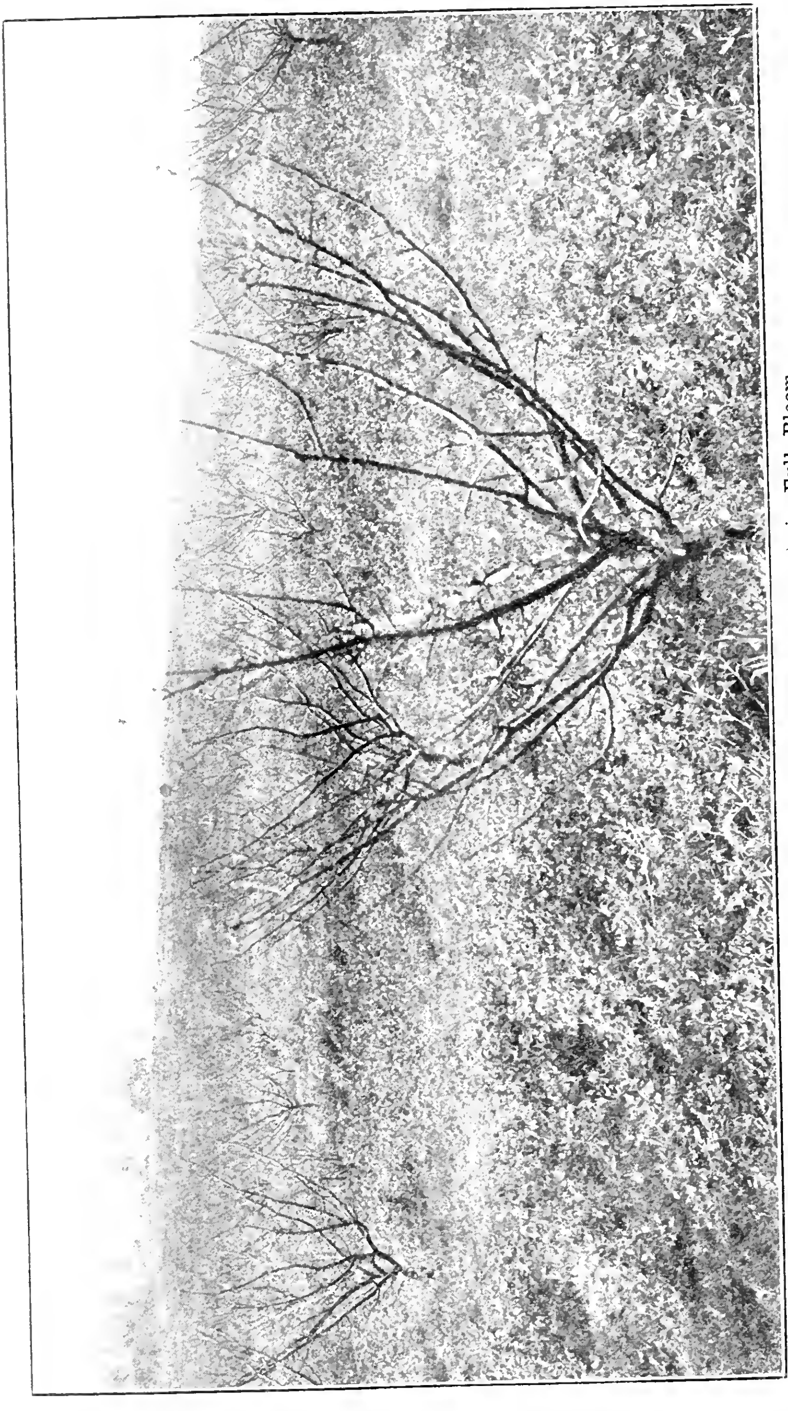


Plate 153.—The Field Pea (*Pisum arvense*) in Full Bloom.

manured with bone dust and superphosphate, as soon as the late maturing apples have been gathered. Heavier crops of peas are obtained, however, when they are sown in drills, and cultivated occasionally during their growth. When a fairly mild winter follows the sowing of the peas, they generally arrive at the proper condition for ploughing under about the time the early flowering apple trees are in full bloom, which varies, according to weather conditions, from the 1st to the 14th of October.

Plate 153 illustrates a crop of field peas, sown broadcast, in full bloom, and in the proper condition to be ploughed under. Plants, or portions of plants, containing a maximum of cell sap when turned under decompose more readily than those more matured. When the seeds are allowed to partly develop in the pods, before being buried, the vascular system and cutical portions of the plants begin to lignify. This con-

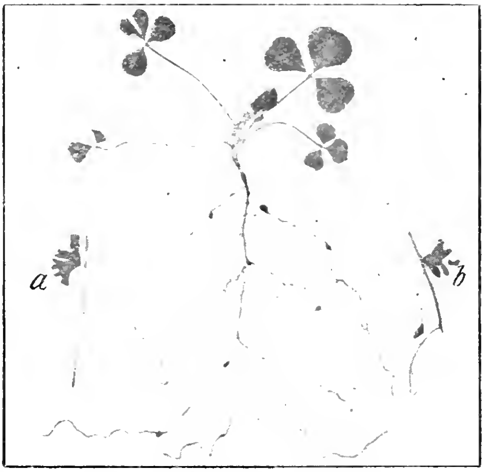


Plate 154.—A Trifolium (*Medicago*) Seedling, seventeen days old, showing nodules on roots (natural size). (*a*) and (*b*) illustrate nodules (natural size) taken from a plant of the same variety, eight weeks old.

dition, with, perhaps, an insufficiency of soil moisture, retards decomposition, and consequently bacterial activity.

Green manure should be buried to a depth of from 6 to 8 inches, and the most suitable implement to employ for this work is a two-furrow orchard plough with circular revolving coulters. When the crop is heavy and difficult to plough under in the ordinary way, these ploughs may be fitted with weed-burying attachments. When the green crop has been buried, the rate of decomposition, its subsequent nitrification and assimilation by the soil, largely depend on the quantity of moisture present and the maintenance of the soil's aeration during the process. Where the ground lacks sufficient moisture, this should be supplied by irrigation, and the soil may be kept sufficiently aerated by using a light drag-harrow or spring tooth cultivator, set for shallow working. Though deep cultivation is practised at this time, it is not advised, as quantities

of the decaying vegetable matter would thus be brought to the surface, and this is most undesirable.

The Trifolium (*Medicago*) seedling shown in Plate 154 has been chosen to illustrate the nodules on the roots of leguminous plants, and shows that they commence to delevop as soon as the roots have extended a short distance from their base, and how they subsequently multiply. This is a photograph (natural size) of the specimens it depicts. The seedling was seventeen days old when removed, with its roots intact, from the box of sandy soil in which it was grown. The nodules shown in the illustration, and marked (*a*) and (*b*), were cut from a plant of the same variety eight weeks old.

As the complete change from the growing plants into the decomposed, and subsequently nitrified and soluble form, as food for the trees, occupies a considerable period, no time should be lost in ploughing the peas under as soon as they have collected their maximum of cell sap and completed their nodule development. Especially on poor soil, the crop should be enabled, by the assistance of artificial fertilizers—superphosphate, bone dust, or nitrate of soda—to commence growth in early autumn, and be sufficiently matured for turning under in early spring. Provided this phase of green manuring be treated with the promptitude which its importance demands, the orchardist may reasonably assume that the chemical changes necessary to render the soluble nitrates available for his trees will have commenced by the time the trees have begun vigorous growth, and will continue afterwards to supply the food for fruit development.

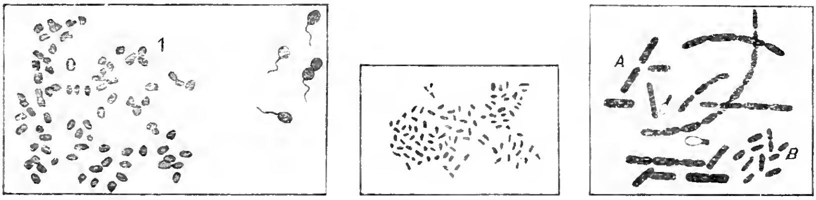
A most interesting article on the "Nitrification of Organic Manures," by Jno. W. Paterson, B.Sc., Ph.D., formerly experimentalist, and P. R. Scott, Chemist for Agriculture, was published in the *Journal of Agriculture*, June, 1914.

The article deals, under various headings, with the different forms of nitrogen, production of nitrates, production of ammonia, action of soil bacteria, conditions influencing ammonification, and rate of ammonification, &c. Tabulated results of tests made in the laboratory are also given in detail.

Plate 155 was employed to illustrate the article, which, however, is too long to permit of its being reprinted in full here, but the writer regards as an interesting and instructive compendium the authors' summary, which is as follows:—

1. Nitrogen exists in soils and manures in three forms.
2. Nitrate nitrogen is required by plants.
3. Ammonia nitrogen is the raw material for producing nitrates.
4. Organic nitrogen is the raw material for producing ammonia.
5. Bacteria change ammonia into nitrates.
6. Another kind of bacteria change organic nitrogen into ammonia.
7. Animal and vegetable manures contain their nitrogen as organic nitrogen.
8. Their rapidity of action depends, in the first place, upon the rate at which their nitrogen is converted into ammonia.
9. In any case, the change is gradual, and requires time.
10. Lime hastens the change.
11. A sufficient soil moisture hastens the change.

12. The rate of change depends also very largely on the class of manure.
13. Bone and blood may have four-fifths of their nitrogen rendered available in four months.
14. Quickly-acting manures are soonest exhausted.
15. Half the nitrogen in lucerne may be rendered available in four months.
16. Very heavy dressings of fresh stable manure, as in the garden, may be worse than useless by destroying any nitrates present.
17. This danger will be most prominent on land which is fairly wet, and in wet seasons.
18. A moderate dressing of stable manure will yield nitrates gradually, and with good result.
19. Leather, horn, hoofs, and wool waste in mixed manures will show nitrogen on analysis, but they will be slow in action.
20. In purchasing manures of organic origin, it is particularly neces sary to know the source from which their nitrogen is derived.



A B C

*Plate 155.—Bacteria which Change the Nitrogen in Soils (highly magnified).

(*a*) Producing nitrites from ammonia (Winogradsky).

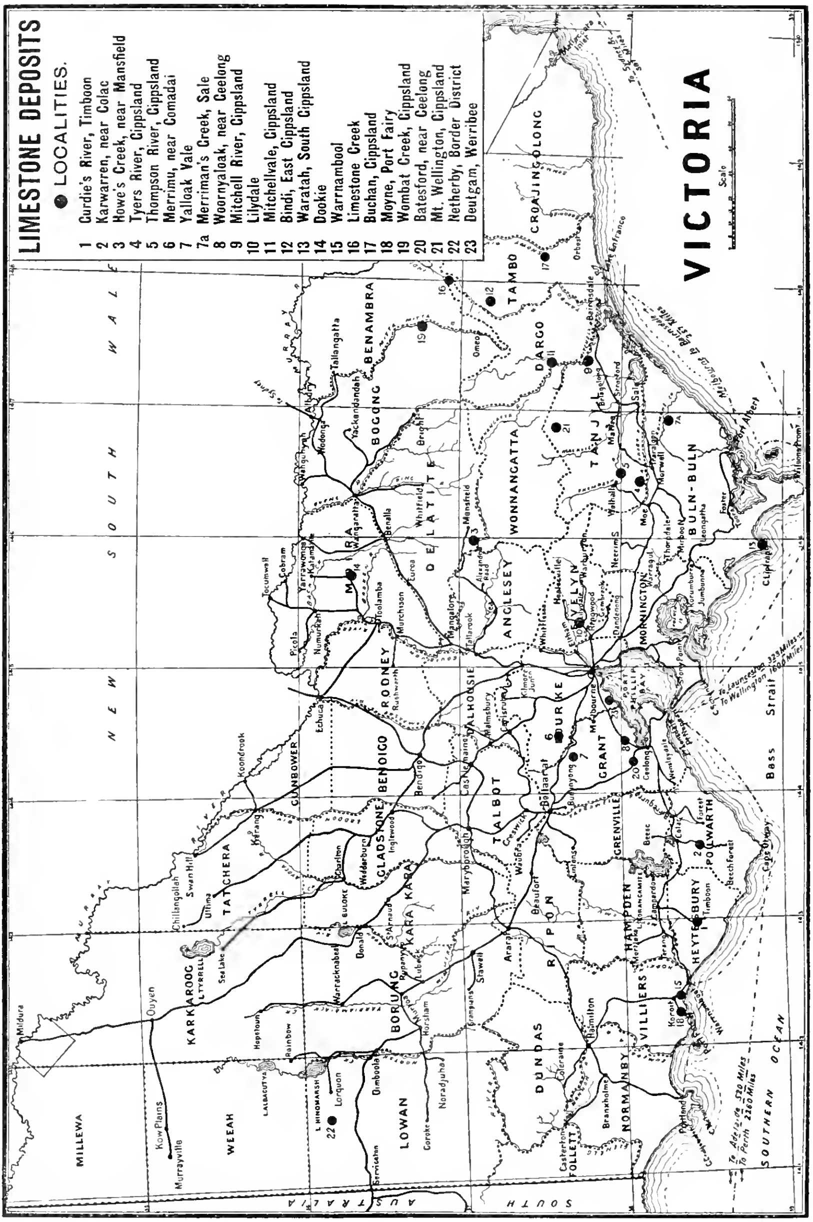
(*b*) producing nitrates from nitrites (Winogradsky).

(*c*) Producing ammonia from organic nitrogen—A. Bac-mycoides; B. Bac-stutzeri (Conn).

THE INFLUENCE OF LIME.

Lime has an important influence on most orchard soils; it helps to make heavy soil more friable, and, besides supplying practically essential plant food, assists in freeing unavailable phosphates and potash. It also enables the changes in manures containing the crude forms of plant food to commence earlier and pass more rapidly through the successive variations by which its ingredients are converted into the soluble form, and thus made available to the feeding roots. Generally speaking, sandy soils do not need lime to the same extent as clayey or peaty kinds, for the reason that the latter, when they become deficient in lime as a plant food, also acquire an acidity, or sourness, that renders them unfavorable to the growth of fruit trees. Virgin soils usually contain lime in sufficient quantities to enable the trees to grow and fruit satisfactorily for some years after being planted. But when the original supplies of plant food have become depleted through continuous

* These illustrations are taken from *Hilgard on Soils.*


LIMESTONE DEPOSITS
● LOCALITIES.
1 Curdie's River, Timboon
2 Karwarren, near Colac
3 Howe's Creek, near Mansfield
4 Tyers River, Gippsland
5 Thompson River, Gippsland
6 Merrimu, near Gomadai
7 Yalloak Vale
7a Merriman's Creek, Sale
8 Woornyaloak, near Geelong
9 Mitchell River, Gippsland
10 Lilydale
11 Mitchellvale, Gippsland
12 Bindi, East Gippsland
13 Waratah, South Gippsland
14 Dookie
15 Warrnambool
16 Limestone Creek
17 Buchan, Gippsland
18 Moyne, Port Fairy
19 Wombat Creek, Gippsland
20 Batesford, near Geelong
21 Mt. Wellington, Gippsland
22 Netherby, Border District
23 Deutgam, Werribee
VICTORIA
Scale

cropping, and the orchardist is obliged to use artificial fertilizers, superphosphate especially, the lime gradually disappears.

An occasional dressing of lime produces a mechanical or physical change in the texture of heavy clay soils, by which they are rendered more friable and less tenacious, while the cohesive properties of light sandy soils are enhanced by similar treatment. Lime may be used in any of four forms—quicklime, slaked lime, ground limestone, and gypsum. Quicklime is the most alkaline, and, when incorporated in sour soil, soon destroys its acidity by uniting with the acids, and changing them into harmless substances, which are neither alkaline nor acid.

The map on page 134 shows the localities in which limestone deposits are situated in Victoria.

Most practical fruitgrowers are able to determine by the general appearance of the soil when it has developed acidity. The less experi-

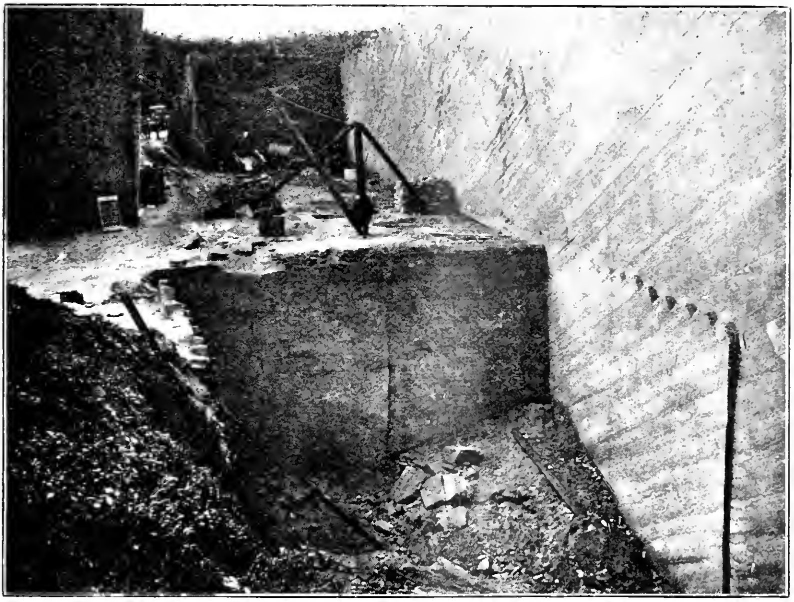


Plate 156.—Steer's Limestone Quarry, Warrnambool, showing accumulation of limestone sand in the foreground.

enced orchardist, however, may ascertain the condition of his soil in this regard by using blue litmus paper. To make the test cut a slit with a knife in the moist earth, place a strip of the paper in the slit and close the earth in against it. If, after a few minutes, when the paper becomes moistened, it turns pink or red the soil is acid, and the redder the colour of the paper the more acid the soil.

Sourness is often caused by stagnant water in orchards with retentive clay subsoils, and in cases of this kind subdrainage should receive first consideration, then an application of lime hastens the sweetening of such soils.

Steer's limestone quarry, at Warrnambool, illustrated in Plate 156, represents a good type of limestone deposit.

Great diversity of opinion, as to the quantity of lime per acre which would constitute a fair dressing, exists among orchardists, and the quantities of fresh slaked lime, which is the form most commonly used, range from 10 cwt. to 2 tons per acre. In determining the suitable amount of lime for an application the orchardist should be influenced chiefly by the state of the soil as regards its acidity, its general physical condition, and manurial wants, as well as its condition regarding drainage. The soil should not be allowed to become wholly depleted of lime before being replenished with this ingredient. It is generally recognised now that better results attend frequent light dressings of lime than accrue from heavy ones applied at long intervals.

Producing Slaked Lime.

Slaked lime is the form most commonly used as a manure by the orchardists. It is obtained when the limestone or calcium carbonate taken from the quarry is submitted to a red heat by being burned in a kiln until the whole of the carbonic acid content of the stone is driven off in the form of gas. What remains of the limestone after the gas has all burned out is known as quicklime or calcium oxide. On water being poured on the quicklime a chemical combination takes place, resulting in the formation of slaked lime or calcium hydrate.

The following has been taken from an article on "The Chemistry of Lime," by P. Rankin Scott, Chemist for Agriculture, published in this *Journal*, October, 1912:—

> In actual practice there are three distinct forms of lime compounds applied to the soil, namely:—
>
> Calcium oxide (CaO) lime.
> Calcium hydrate (CaH_2O_2) slaked lime.
> Calcium carbonate ($CaCO_3$) chalk, limestone, shell, &c.
>
> What these forms are and the relation they bear one to the other can be seen by means of the lime cycle:—

Calcium Carbonate
$CaCO_3$
Limestone, &c.

Calcium Hydrate	Calcium Oxide
CaH_2O_2	CaO
Slaked lime.	Lime.

The above cycle illustrates the changes of one form into the other.

In connexion with the relative value of the different forms of lime and desirable standards, Mr. Scott further writes:—

> 56 lbs. of fresh burnt lime contains the same amount of lime as—
> 56 lbs. of fresh ground lime.
> 74 lbs. of water-slaked lime.
> 100 lbs. of carbonate of lime (as a powder—ground limestone, chalk, &c.).
> 100 lbs. of old air-slaked lime.
> 172 lbs. of sulphate of lime (as gypsum).

Lime.—A good quality lime should contain at least 85 per cent. combined oxide and carbonate, of which not more than 10 per cent. shall be present as carbonate.

Slaked Lime.—A good quality slaked lime should contain at least 85 per cent. of combined oxide, hydrate, and carbonate, of which not more than 10 per cent. shall be present as carbonate.

Carbonate of Lime.—A good quality carbonate of lime should contain at least 85 per cent. of carbonate of lime, and pass through a sieve of 50 meshes to the linear inch.

Gypsum.—A good quality gypsum should contain at least 30 per cent. of calcium oxide.

All other grades should be sold on a guarantee, stating their calcium oxide content.

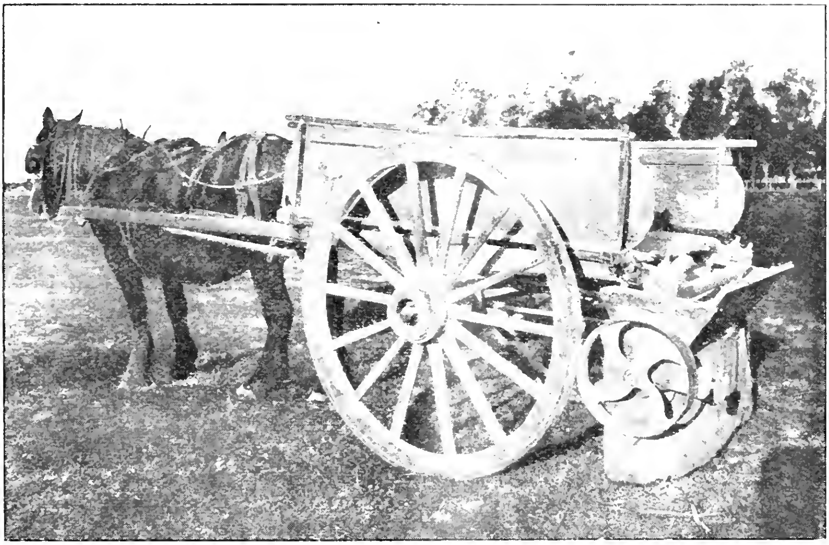


Plate 157.—Lime-spreader Attached to a Farm Dray.

Method of Application.

Usually the slaked lime is carted to the orchard area and spread from an ordinary farm dray with a shovel. This mode of distribution may be improved, however, by attaching to the back of the dray a lime-spreading device like that shown in Plate 157. Any of the more highly perfected and expensive lime spreaders may be employed, but as such an even distribution of the lime is not so necessary in the orchard as is essential in the case of farm crops the cruder implement will meet requirements.

As the tendency of lime is to sink in the soil it should not be ploughed under, but spread broadcast on the ploughed ground and lightly harrowed in.

Lime should not be spread on the surface with manure, particularly that of the farm-yard, because, when it and manure are placed in

contact with each other above the ground, the lime quickly drives off the ammonia of the manure into the air and thus lessens its nitrogen content. Probably the better arrangement in this respect would be, when the land is treated regularly, to use manure and lime during alternate years, and thus provide lime to assist in the decomposition and nitrification of the manure applied subsequently. Or the lime might be harrowed in a short time after the burial of the farm-yard, or green manure.

Mr. A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent, has summarized his comprehensive article on "The Practice of Liming,"* thus:—

1. Lime may be applied in one of four forms: quicklime, slaked lime, ground limestone, and gypsum.
2. One ton of quicklime is equivalent to 1.3 tons slaked lime, 1.8 tons of carbonate of lime, and 3.1 tons gypsum.
3. Lime has an important chemical, mechanical, and biological effect on the soil.
4. It liberates phosphates and potash, decomposes organic matter, promotes nitrification, and corrects the soil acidity.
5. It makes clay soils more friable, and tends to bind sandy soils.
6. It stimulates bacterial activity, and promotes soil fertility.
7. It may be applied in dressings from 5 cwt. to 2 tons per acre, according to the kind of soil, kind of crop, and according to the frequency of application.
8. Small dressings frequently applied are more profitable than heavy dressings applied at long intervals.
9. Lime is best applied by special limespreaders. A good, handy man can make one to work from the back of a farm dray.
10. Quicklime and slaked lime are best applied in autumn, at least some weeks before the seed is sown. Carbonate of lime may be applied when convenient.
11. If quicklime can be purchased for 25s. per ton, then carbonate of lime is worth about 14s. per ton.
12. Quicklime and slaked lime give quickest results. Carbonate of lime is slower, but is ultimately the most profitable.
13. Lime destroys humus; therefore, keep up the supply of organic matter to the soil by green manuring.
14. Lime must be supplemented with phosphates to keep the soil productive.
15. There is urgent need for systematic and permanent experimental work in connexion with liming problems.

In connexion with their article on the "Relation of Lime to Soil Fertility,"* J. W. Paterson, B.Sc., Ph.D., and P. R. Scott, Chemist for Agriculture, give an interesting summary and conclusions as follows:—

1. Lime tends to leave the surface soil through various channels, and fresh applications become necessary to maintain fertility.
2. Carbonate of lime is the best form of lime for the soil.
3. Burnt and slaked lime are rapidly changed to carbonate when they are applied to land.
4. The rate at which lime acts depends on its fineness of division.

* *Journal of Agriculture* (Victoria), October, 1912.

5. Lime, but especially hot lime, has a good effect upon the mechanical condition of stiff clays.
6. Gypsum also coagulates clay, but it has not the beneficial action of lime in other directions.
7. Lime greatly hastens the production of nitrates.
8. It has a good effect in liberating potash and phosphoric acid, especially when the latter is combined with iron or alumina.
9. Where required by soil, lime produces larger crops.
10. It produces root crops, which are of greater feeding value per ton.
11. It may often be a profitable application to grass land.
12. Lime kills sorrel, docks, and other acid-loving weeds.
13. It is specially stimulating to lucerne, clovers, and leguminous plants.
14. Lime will not act if phosphates are deficient.
15. It increases the need, everywhere present, of ploughing in green manures or stubbles.
16. It facilitates this operation.
17. The surest method of determining the need for lime is to dress trial strips and await results.

In an article on "Lime for Orchards,"* Mr. P. J. Carmody, Chief Orchard Supervisor, dealing in a practical manner with the effect of lime on fruit and fruit trees, and advocating its use, writes:—

> "When it is considered that the average crop of fruit requires more plant food for its development than an average crop of wheat, and, moreover, that the fruit demands the same soil constituents year after year, the necessity for a sweet and favorable medium for root pasturage is apparent; and as no other application is at all comparable to the influence of lime for this purpose, its frequent use is urgently required. It is a matter of common observation that the fruit-buds of trees grown on sour soils are of a weak or indefinite character, while the bark is harsh and dry in appearance, and the growth more or less stunted. Under such conditions it is practically impossible to develop trees on the most profitable lines without first correcting soil acidity by the free use of lime in the same manner as requires to be adopted for other farm crops.
>
> In many parts of the State insufficient attention has been given to this feature of soil management in the orchards. Particularly is this the case where fruit is grown on heavy clay soils. In these soils fruit trees grow through a lengthy period, so that a considerable quantity of immature wood is produced to the detriment of subsequent crops of fruit. Measures have not hitherto been adopted to definitely determine the actual effect of lime on the different parts of the tree; but investigations in other countries show that on soils rich in lime the wood is matured earlier and the fruit-buds are more stocky and robust than is the case with trees grown on soils deficient in lime. This is very apparent to any one acquainted with the fruit areas of many parts of Gippsland and other places in Southern Victoria, and one is struck

* *Journal of Agriculture* (Victoria), October, 1912.

with the unusual prominence or length of the fruit-buds, the relative distance between the nodes, and the softness of the wood in these districts when compared with the same varieties grown in fruit centres known to possess lime in abundance.

It may not, however, be correct to assign these differences solely to the effect of lime, as other soil constituents bear an important part on the character of the tree and its fruit-buds, particularly potash. It is generally recognised that the trees are not so manageable nor so prolific in bearing in soils where lime is deficient, and growers who have rectified this have had excellent results, though as artificial fertilizers were subsequently applied the same year, the relative value of the lime could not be ascertained. Though lime plays an important part in the apple and pear tree, it is in the stone fruits that its value is most apparent. It is a familiar fact that in soils rich in lime the stone fruits set their crops well, and are not so prone to cast off their fruit at the period of 'stoning' as is otherwise the case. Where trees are making extensive wood growth with abundant foliage there is but little doubt that the application of lime at the rate of 7 to 8 cwt. to the acre would be of pronounced benefit.

No class of fruit is more eloquent in its request for specific soil constituents than the citrus. A light yellowish appearance of the leaves demands an application of nitrogenous manures, whilst the want of phosphoric acid is evidenced by many of the light laterals dying off. In a soil where lime is abundant the thinness of the rind, the deep colour and delicate aroma of the fruit are special features of the orange, so that beneficial effects are obtained by the use of lime in almost all classes of fruit."

(To be continued.)

Fungous diseases are much more difficult to control in most cases than insects. One must fight something that he cannot see but feels sure will come later in the shape of diseases. There is little that can be done to destroy or control diseases after they have become visible to the naked eye. These diseases come from minute spores that float through the air in very large numbers and come to rest on the plants. When the proper time and conditions come, these spores grow and enter the tissue of the plant on which they feed. After the disease once enters the tissue of the plant there is no remedy. Nothing can be applied that will kill the disease and not harm the plant. It is the spores, then, that must be killed. With this explanation it is easily seen that the so-called fungicides are really "sporocides," and must be used before the spores grow. —*California Cultivator*, 26/1/16.

VINEYARD SPRAYING.

By F. de Castella, Government Viticulturist.

Consternation has arisen in the minds of many of our vine-growers as the result of the grave damage recently caused by Downy Mildew in many of our vineyards—nor is this to be wondered at, seeing that this, our first invasion, has been an exceedingly virulent one. To make matters worse, it was not hindered to any extent by protective spraying. Owing to long immunity from fungus diseases, our vine-growers were quite inexperienced concerning spray mixtures and their mode of application, hence the feelings, almost amounting to dismay, with which advice to spray was very generally received. Not so with our orchardists, for whom spraying has long since been a necessary evil, or, more correctly, a compulsory insurance. The experience of a good many years has proved to them that, in the absence of protective sprays, a payable fruit crop is not to be relied on.

Henceforth, however, vine-growers will have to fall into line with orchardists, and adopt the copper sprays which, in Europe, alone render possible the vintaging of the grape crop. Concerning the efficacy of such treatment, there is, fortunately, no longer any room for doubt. Copper sprays afford complete protection provided they are opportune, properly prepared, and thoroughly applied.

This much admitted, the question naturally arises—at what cost? The oft-repeated spraying necessary in Central France would render profitable vine-growing impossible under our conditions. The assurance can safely be given, however, that such will never be required here. In Algeria mildew yields readily to timely treatment, the expense of which does not impose a severe tax on growers, and so will it prove with us. The 1917-18 disaster in the Rutherglen district is the direct outcome of an unfortunate combination of circumstances, viz., a season abnormally favorable to fungus development—one in which our usual climatic protection has absolutely failed us; added to this, was total absence of protective spraying. That copper could have afforded safety is strikingly demonstrated at one vineyard in the district, where early spraying was carried out on a portion of the area under vines. Here the bulk of the crop has been saved, whereas on the unsprayed portion the loss is almost complete. And yet only one spraying was given. Such a result, in a season so wet as this has been, augurs well for the future.

The composition of spray mixtures and most suitable time for their application, though questions of vital importance, may be held over for the present, since no winter treatment is of any avail against Downy Mildew (see *Journal* for November, p. 697). The subject of the present article is the method of application of the spray mixture; in other words, the spraying outfit. To insure protection, our vines must be sprayed. How this object can be most efficiently and economically achieved—in other words, with the least expenditure of labour and material—is the problem awaiting solution.

Early consideration of this phase of the question is opportune, in order that preparations may be made in due time for next spring's campaign. Spraying must commence in October.

It is not only at Rutherglen, however, that our vine-growers are interested in vineyard spraying. The extreme prevalence of "Black

Spot" at Mildura, resulting from the over-abundant moisture of the last two seasons, necessitates prevention of summer infection by means of copper mixtures applied in early spring, and supplementary to the winter swab; spraying has thus acquired an importance at Mildura such as has been quite unknown during the past 25 years. Mildura growers must

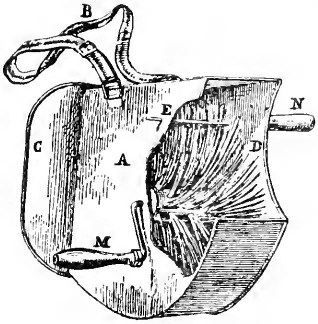


Fig. 1.—Cazenave's Brush Sprinkler (from P. Viala—Maladies de la Vigne, 1st Edition, 1887.

Fig. 2.—Japy's Brush Sprinkler (after Viala).

also remember that it is extremely probable that they will ere long have to reckon with the Downy Mildew fungus, which, during the currency of the present summer, has found its way from Rutherglen to the Lilydale district, Whittlesea, Sunbury, the Goulburn Valley, and, no doubt, a good many other localities.

Evolution of the Modern Spray.

The efficacy of copper was discovered as far back as 1885. At this time modern spray pumps were unknown, and the first applications of Bordeaux mixture were made by means of a brush or whisk of heather twigs tied together. The sprinkling thus carried out was manifestly inferior to the fine modern spray; nevertheless, a remarkable degree of protection was obtained. Improvements were attempted, and numerous mechanical devices were introduced, among the earliest of which were rotary brushes, such as are shown in Figs. 1 and 2; these were so devised that the bristles could be momentarily held back by a transverse bar. On their sudden release, the liquid with which they are wetted is projected on to the vine in small drops. Improvements were gradually introduced until the spray pump, in something like its present form, was evolved, one of the most noteworthy developments being the introduction of the

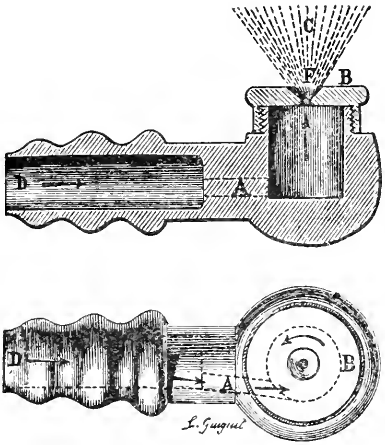


Fig. 3.—Riley's Cyclone Nozzle (after Viala).

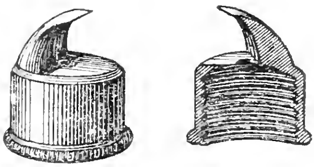


Fig. 4.—Raveneau's jet (after Viala).

Riley or cyclone nozzle,* which really constituted a revolution in spraying, and is at the present day, in one or other of its improved forms, the one most generally used. Fig. 3 shows the earlier form of Riley nozzle.

* The earliest description of the Cyclone Nozzle, and the principle on which it is based, seems to be that which is contained in the fourth or final report of the U.S.A. Entomological Commission on the Cotton Worm, by Chas. V. Riley, P.H.D., published in 1881. A chapter contributed by Professor W. S. Barnard deals with the different nozzles in use, and among these several types of centrifugal or eddy-chamber nozzles are described.

That we are indebted to Professor Riley and his staff for this ingenious invention is shown by the following extract from this report :—" Eddy chamber jets are produced by new spray devices invented and developed in the progress of the commission work."

The following particulars, extracted from the same report, will no doubt be read with interest :—

" Centrifugal sprinklers expand the jet by giving it a rapid rotary motion, which, by the centrifugal force generated, throws the fluid into a shower of particles.

The chamber is usually of disc-like or annular shape. There is preferably a single inlet which discharges into the chamber in an eccentric direction parallel to a tangent to its circumference. Such a device gives to the fluid forced into it a centripetal geometrically involute course, very completely converting the in-current projectile or translatory velocity or motion into velocity of rotation, apparently increasing towards the centre, which generally has an immediate discharge by an outlet through the face of the chamber, and not by a long pipe. The fluid within proceeds in an in-winding course approximating parallelism to the thin lips of the outlet, so that the tendency to preserve this direction, by its momentum, after being freed, disperses it in the form of a whorl of diverging tangents from the lip margins. . . . . . . The principle of in-wrapping centripetal deflection with little or no axial movementuntil the outlet discharge is reached is one of the special characteristics of the eddy jets. Thereby is gained an intense rotation at the discharge, and a broad fine spray therefrom. The velocity of rotation produced in these nozzles is remarkably rapid, as exhibited by experimenting with one having a glass-faced chamber to show action, within."

Numerous other types of nozzles exist; for example, the Raveneau jet shown in Fig. 4, which appears to have given a satisfactory spray.

Orchard and Potato Sprays.

Hitherto the use of copper sprays in Victoria has been limited to orchardists and potato-growers. The problems which must be solved

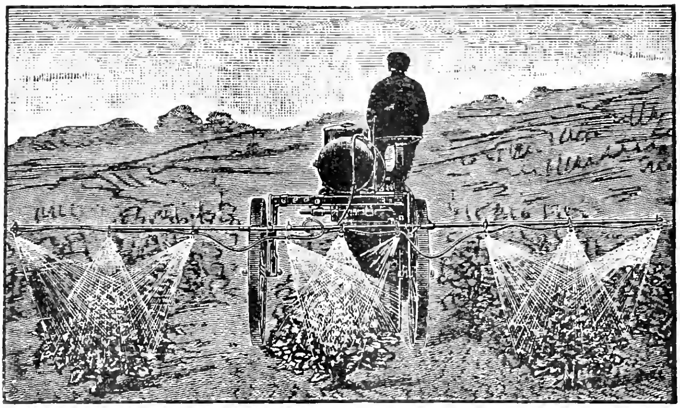


Fig. 5.—Vermorel's Sprayer for potatoes or low-growing vines (from Bourcart "Insecticides, Fungicides, and Weed Killers.")

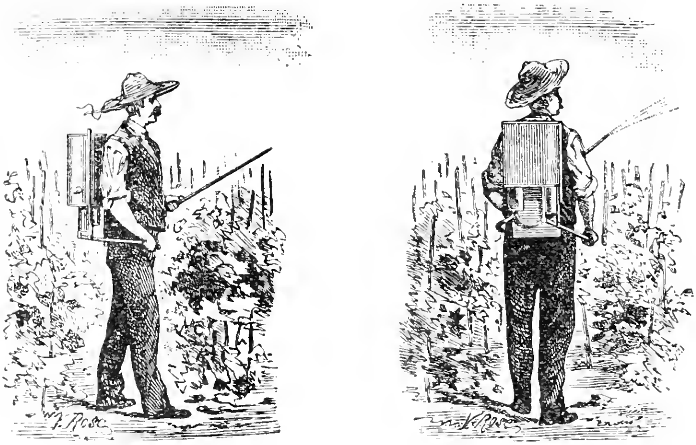


Fig. 6.—Vigouroux Knapsack Sprayer, side and back view (after Viala).

in order to protect these crops are, however, somewhat different to those which confront vine-growers. It is evident that the spraying of a large apple tree, for example, is a very different operation to that of a small, more or less, trailing shrub, such as a vine. In the former case the pump remains stationary alongside the tree until this has been completely sprayed, an operation which may require several minutes; the progress of the pump is, in fact, essentially intermittent.

Potato-growers, on the other hand, have to deal with a low-growing crop, which can be rapidly saturated with the spray. Several fixed nozzles are so arranged that one or two will treat a row of potatoes; several rows are thus simultaneously treated, thus enabling a large area to be treated in a short time by a continuously advancing outfit. The machine shown in Fig. 5 can be used for spraying potatoes or low-growing vines.

The vine really occupies a position intermediate between the fruit tree and the potato, both as regards the size of the plant itself and the time required to treat it. Even among vines requirements vary greatly, according to the distance between the rows, the size of the vines, and the arrangement of the vines in the row. In trellised vines, the growing portions of which are in contact throughout the whole length of the row, continuous spraying is possible. In staked vines, on the other hand, the work is preferably intermittent; a continuously acting spray would mean a loss of spraying material at the interval between the vines.

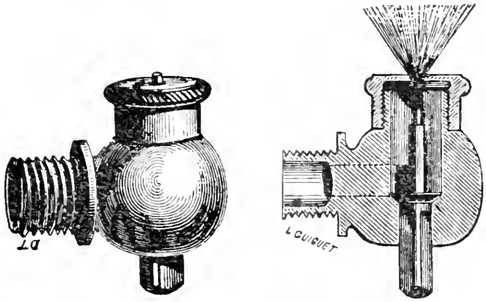


Fig. 7.—Vermorel's Modification of the Riley Nozzle (after Viala).

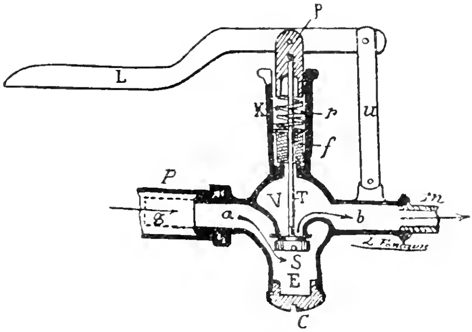
Knapsack Sprays.

Since the introduction of spraying in French vineyards, knapsack spray pumps have, until recently, been most generally used. (Fig. 6.) Before passing on to the consideration of the larger machines which are gradually displacing them, these may be briefly described; the essential parts of both are similar, and can more conveniently be summarily described in connexion with the smaller knapsack machines.

All spray pumps consist of three essential parts—(1) a reservoir to contain the spray mixture; (2) a nozzle by which the liquid is converted into a fine spray or mist; (3) a pump by means of which the liquid is conveyed under pressure to the nozzle. For use with copper mixture, the reservoir must be made of copper or some metal on which these liquids have no action. It is usually provided with an agitator, which serves to keep the sediment—really the active portion of the mixture—in suspension.

Most of the nozzles now in use are modifications of Riley's original cyclone nozzle (Fig. 3), which consists of a small, hollow cylinder, into which the liquid is brought under pressure by the oblique passage A. The cylinder is closed by a metal cap, pierced in its centre by a small aperture. It will be seen that the liquid is forced in tangentially, this

causing it to gyrate rapidly in the cylinder before escaping through the orifice, which it leaves with a rapid spinning motion. Under the action of centrifugal force the jet immediately opens out into a cup or tulip-shaped hollow cone, the edges of which soon become disintegrated into



No. 8.—Vermorel's Interrupter for Spray Pumps. (From L. Fontaine in "La Revue de Viticulture."—8th June, 1911).

Fig. 9.—Jet and Nozzle fitted with Vermorel's Interrupter (after Fontaine).

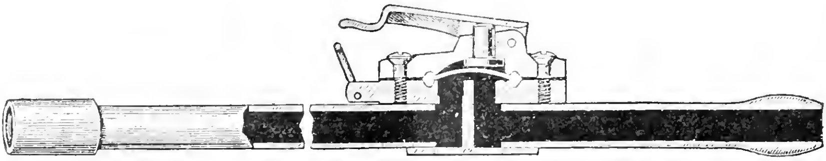


Fig. 10.—Jullian's Interrupter (section) (after Fontaine).

Fig. 11.—Spray Pump Tube fitted with Jullian's Interrupter. A strainer to prevent clogging of the nozzle is seen to the right (after Fontaine).

very minute drops, comparable to powder, whence the term *pulverizateur*, by which spray pumps are known in France. The chief defect of this ingenious nozzle was its liability to clog, owing to the smallness of the aperture. This has been overcome in various ways; one of these is shown in Fig. 7, which illustrates Vermorel's modification.

As will be seen, opposite to the spray aperture is a larger orifice through which projects a metal plug. This plug constitutes a valve completely closing this orifice when the nozzle is working. On the inside the plug bears a peg arranged in such a way that it can be pushed right through the spray aperture, in case this should clog, by pressing on the exterior part of the plug with the thumb. This not only clears the spray aperture, but allows the obstruction to escape through the opened valve, which immediately closes again under the pressure of the liquid. A spiral spring was added later, which causes the valve to close more tightly. This is shown in Fig. 13. This device is very convenient on all hand-directed sprays. Strainers of various types are also fitted to nozzles to prevent clogging. Several excellent nozzles working on the cyclone or eddy principle are now manufactured in

Fig. 12.—Vermorel's Knapsack Sprayer, "Eclair."

Fig. 13.—Vermorel's Knapsack Sprayer, "Eclair"—larger view showing spring addition to non-clogging nozzle.

this State, into the relative merits of which it is evidently impossible to go here.

In a general way, it will be found that the higher the pressure the finer and more efficient the spray; the difference between the fog-like mist sent out by a nozzle working at high pressure and the few large drops which it sprinkles rather than sprays if the pressure be allowed to fall too low, is very striking.

The liquid is conveyed under pressure from the reservoir to the nozzle through a pipe, portion of which is flexible rubber hose and the other part a metal tube. Sometimes the metal portion is fitted with an interrupter, of which there are several types. On knapsack sprayers interrupters are very convenient, and in the case of staked vines they permit an appreciable saving of spray liquid, by enabling the operator

to shut off the spray when passing the interval between the vines in the row. Interrupters are shown in Figs. 8, 9, 10, and 11.

Pumps are of two types, viz., direct acting and air compressors. In the former case the spray liquid is forced directly into the tube communicating with the nozzle, pressure being equalized by means of an air chamber. Vermorel's well-known knapsack sprayer (Figs. 12 and 13) is based on this principle. In this machine the pump is much simplified, the piston being replaced by a rubber diaphragm situated at the base of the air chamber, and which can be raised or lowered by operating the handle. Several sprayers on very similar lines to Vermorel's are manufactured by British and American firms.

In the second case, the reservoir of spraying liquid is so constructed that it may be hermetically closed by means of a screw plug. The pump, which consists of an air compressor, and not a pump for liquids, compresses the air in the upper portion of the reservoir. An occasional stroke of the pump maintains a sufficient pressure to insure a satisfactory spray.

In the case of a popular American sprayer worked by compressed air, each outfit has its own air pump, which provides the necessary compression after the reservoir has been charged with spray mixture. As spraying proceeds, pressure necessarily falls. A few strokes of the air pump soon restore it. An efficient interruptor and a strainer to prevent clogging are useful features.

By arranging the compressed air inlet at the bottom instead of the top of the reservoir, the air bubbles rising through the liquid keep the sediment in suspension and play the part of an agitator.

In some types of sprayers the pump is detachable, the part carried by the operator merely consisting of a reservoir, tube (with interrupter), and nozzle; the air pump is of similar pattern to those used for inflating motor car tyres. The reservoir is half filled with liquid, and charged with a sufficiency of compressed air to maintain the pressure until the whole of the liquid is discharged, something after the style of a seltzogene or soda-water syphon. Spraying outfits of this type have been devised in which one central air pump serves for the charging of several knapsack sprayers.

Limitations of the Knapsack Spray Pump.

The knapsack spray pump, like other machines, has its drawbacks as well as its advantages. True, it permits, in the hands of a careful and conscientious operator, very thorough and economical application of the spray mixture, more especially if provided with an interrupter. The saving of copper sulphate thus rendered possible is worthy of serious consideration, in view of the abnormally high price of this indispensable salt at the present time.

It also enables the spray to be applied exactly where it is required; on the embryo bunches, for example, in the case of the first application, in order to protect against the deadly bunch-mildew or grey-rot, which was the main cause of loss of crop at Rutherglen this season.

Another point which has given rise to considerable controversy is as to whether the spray should be applied to the upper or under side of the leaf. Infection by the fungus can only take place through the stomata or breathing pores, which are situated almost exclusively on the under side: this being so, it was contended by several authorities, some seven

years back, that spraying as usually carried out, especially with the larger power sprays, could not afford the maximum of protection; they recommended knapsack spraying with bent nozzles, so used as to apply the bulk of the spray to the lower side. Obviously under-side spraying can best be carried out with machines of knapsack type, or, at least, with hand-directed nozzles. Fortunately for growers, the superiority of under-side spraying has not been borne out by experience during the last few years; practically equal protection was obtained by spraying in the usual way.* This phase of the question will be dealt with at greater length in a subsequent article. For the present it will suffice to state that ordinary spraying, if timely and thorough, can afford complete protection.

Notwithstanding these advantages, the knapsack spray has several serious drawbacks, the chief of which is its limited capacity. It is

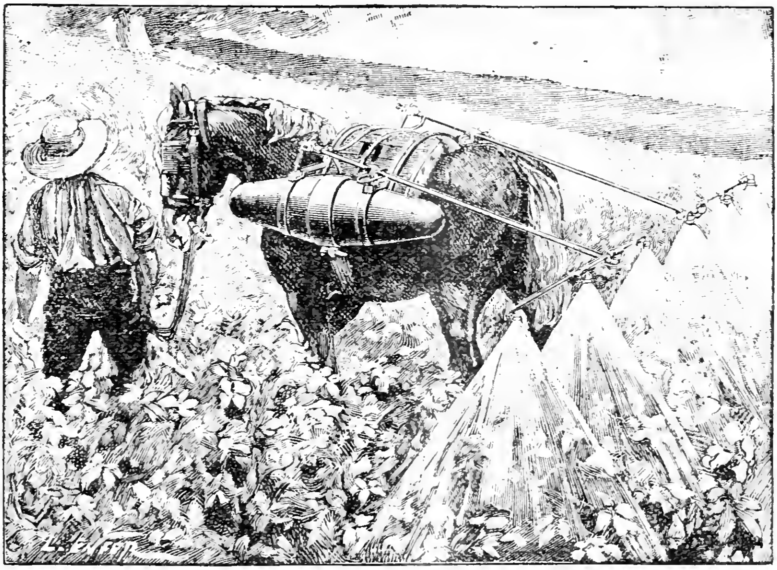


Fig. 14.—Rousset's Pack-horse Spraying Outfit. The pump for charging and air compressing is not shown in the illustration.

scarcely possible to treat more than an acre and a half per day with one of these machines. As has been already pointed out (*Journal*, November, 1917, p. 694), the time within which spraying should be executed is largely governed by the incubation period of the Mildew Fungus, which usually occupies seven days. It is thus within this period that the whole vineyard must generally be treated. The small grower, with 20 acres or so of vines, can achieve this result with one, or at most a couple, of knapsack sprays—not so the owner of larger areas, who will find this means of application far less satisfactory.

With this machine, the cost of spraying per acre in labour alone is very considerable, since each man only directs one nozzle. It is by

* Under-side spraying may prove advantageous for the earliest application The first infection results from the germination of the oospores, or winter spores, in the soil, and the zoospores, which they emit, being splashed by heavy rain on to the lower leaves. Subsequent infection is by air-borne spores.

multiplying the number of nozzles operated by one man that economy in labour can best be effected.

With the knapsack machine, spraying is irksome and laborious; heavy weights of liquid must be carried on the operator's back, and the working of the pump entails a constant strain. In the hands of any but very conscientious workmen, pressure is not adequately maintained, with the result that the vines are sprinkled rather than sprayed, the protective value of the treatment being considerably reduced. The vigneron who sprays his own vines has more incentive to put up with these drawbacks of the knapsack machine than the day labourer.

Fig. 15.—Vermorel's older model Traction Spray Pump for low-growing vines.

Pack-horse Sprays.

These are largely used in Southern France, where the system of training—or absence of training*—would hinder the passage of wheeled implements. They are also very useful for vineyards on steep hillsides. This type of sprayer is illustrated in Fig. 14. The two reservoirs, one on either side of the horse or mule, are half filled with liquid, and sufficiently charged with compressed air to insure a satisfactory spray until emptied. The shape of the reservoirs and the movement of the horse provides sufficient agitation to keep sediment in suspension.

The chief defect of this system is one common to all machines operated by compressed air; the pressure when first charged is much higher, and the spray consequently more efficient than when they are nearly empty. More detailed description of this type is needless; these machines are not obtainable in Victoria, nor are they necessary, since

* In the heavy-bearing vineyards of the Midi (near Montpellier) the bulk of the vines are neither tied up nor trained in any way; neither are they topped. Cultivation is carried out very thoroughly until the length of the young canes prevents the passage of implements; after this, with the exception of spraying and sulphuring, the vines are left to themselves until vintage time.

our wider rows, and the methods of training usually followed permit the passage of outfits on wheels at any time. They might possibly prove of service, however, in vineyards, the soil of which, in a very wet season, becomes too soft for wheeled vehicles.

Horse-drawn Spray Pumps.

In large spray pumps drawn by horses we no doubt have the class of machine which will prove most suitable under Australian conditions, especially for the treatment of large areas.

The simplest form of traction spray outfit would consist of a cart, or other suitable vehicle, bearing the reservoir of spray material and the pump serving to raise the pressure to the required point; long rubber hoses convey this to the nozzles, each of which is directed by a workman. This is the type in general use in Victorian orchards. Some of our vineyards have already been sprayed this season in such a manner. Four rows were sprayed at a time, two on either side of the cart. The

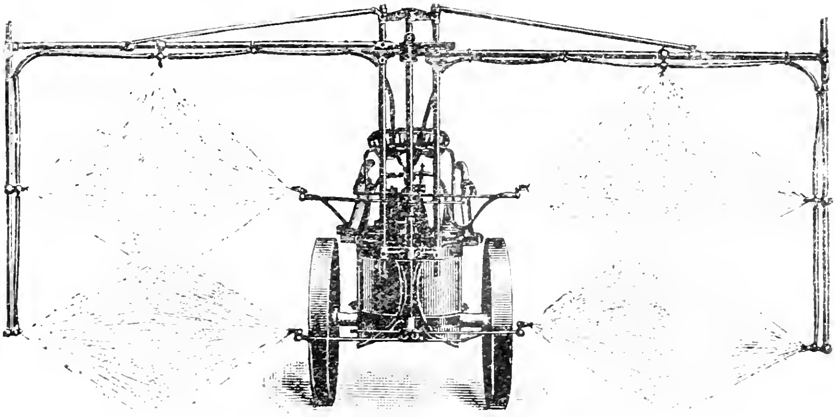


Fig. 16.—Perras modern wheel-driven Traction Spray Pump, the nozzles being arranged to treat two rows of vines (on both sides) simultaneously.

vines were treated in sets of twelve at a time—three in each row—after which the cart moved on a few yards for the treatment of a fresh lot.

In this way, the spray can be thoroughly and efficiently applied, but the work entails too much labour, since every nozzle requires a man to direct it, in addition to the one who works the pump and drives the horse. It is true that the work is much less laborious for the men directing the nozzles than knapsack spraying; it has thus a better chance of being properly carried out. A better pressure can also be maintained, thus insuring a more efficient spray, and one which will treat rather more vines, nevertheless, the number of vines which can be treated with each nozzle is not much greater than in the case of the knapsack machine.

What is really required for the economical spraying of our vineyards is something more after the style of the continuous acting potato sprayer (Fig. 5). In France, machines of this type have long been in general use, especially in large vineyards. One very similar to Vermorel's earlier traction sprayer (Fig. 15) was advertised as far back as 1894.

In machines of this type the pump is either chain-driven or worked by cranks on the axle. All the operator has to do is to drive the horse. The nozzles are fixed in such a way as to direct the spray where it is required; it will be seen that one man is able to operate a large number of nozzles, thus permitting a considerable saving of labour. The machine moves forward continuously at a walking pace, which enables the properly-situated nozzles to distribute to each vine its quota of spray mixture.

Improvements have been gradually introduced in general arrangement of the machines, in pumps, and in many minor details, so that the models now turned out by leading French firms have reached a high standard of perfection. Among the best French makes may be mentioned the spray pumps manufactured by M. P. Perras, of Belleville-sur-Saône (Rhône). A description of the machine made by this firm

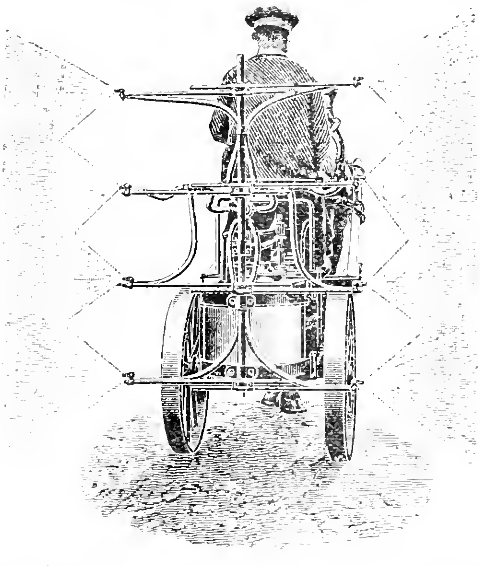


Fig. 17.—Perras machine arranged for taller vines—two half rows are being treated.

appeared in *La Revue de Viticulture* of 13th March, 1913. The general arrangement of the sprays for the treatment of two rows at a time is shown in Fig. 16. Fig. 17 illustrates another mode of adjusting the nozzles suitable for the treatment of vines such a size that it is not possible to treat more than two half rows at a time. Fig. 18 is a side view of the same machine, showing how the tubes which supply the nozzles may be folded for transport.

This illustration gives a good idea of the lightness and elegance of the Perras machine. The arrangement of reservoirs and pumps (there are two of each), and the way in which they are operated from the axle, will be readily understood. In these spray pumps both pressure and output of liquid are adjustable.

In all modern French machines, the arrangement of the nozzles can be altered in a great many different ways, and in a very short time.

This facility of adjustment to suit varying requirements is very necessary; it is evident that an arrangement of nozzles which would be satisfactory in October, when the vine shoots are about 12 to 18 inches long, would be quite unsuitable after Christmas.

French machines are unobtainable in Australia at present, nor does there appear to be any chance of importing them for the coming spraying campaign, which will commence in October. Victorian machinery firms, however, are coming to the rescue, and there is every reason to believe that locally-made machines will be available in due time, so devised as to present the advantages possessed by the Perras and other up-to-date French makes. Local firms already turn out excellent potato sprayers; with a few modifications in the directions suggested above, these can, no doubt, be made suitable for vineyard work. Excellent machines of all the types dealt with in this article—from knapsack to motor-driven—are now largely manufactured in America. Several American firms are interesting themselves in the question and arranging to supply outfits in good time for the coming October campaign.

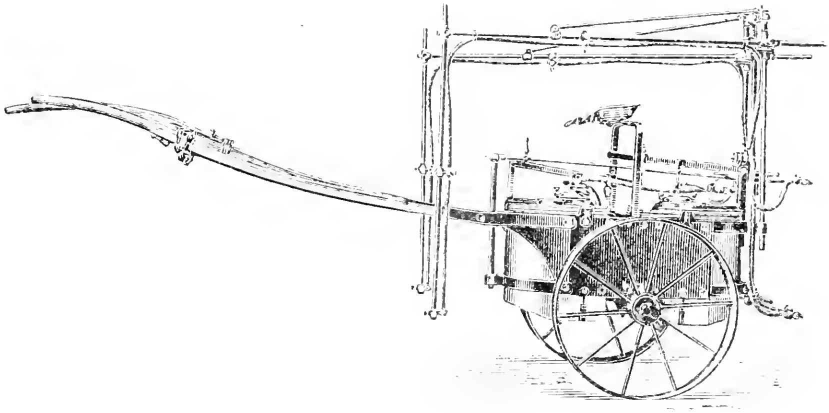


Fig. 18.—Perras machine, showing nozzle supports folded for transit.

Power Spray Pumps.

These are coming more and more into general favour with orchardists, to whom, in view of the intermittent progress of the spray outfit, wheel-driven pumps are useless. A small motor (oil or petrol) advantageously replaces the man who operated the pump with the older outfit. The high pressure which can be easily maintained in several nozzles at a time insures a thoroughly efficient spray, and permits of several trees being treated simultaneously.

A motor-driven outfit for the spraying of potatoes is shown in Fig. 20. Is the motor-driven pump likely to be also adopted by vine-growers? In other words, is it destined to displace the wheel-driven machine described above? Time alone will tell. In some directions the motor pump appears to promise advantages. The draught of the spraying machine, for example, will be lighter if the wheels no longer have to operate the pump. Such lighter draught would prove a boon when the

vineyard soil is saturated with moisture, as it was during the whole of October last in most Rutherglen vineyards. In many of these, dray traffic was impossible, let alone a spray outfit with wheel-driven pump. It must be remembered that it is precisely in a wet season that spray protection is most vitally needed. In a dry spring, when the ground is usually fit for traffic, it is much less necessary. One vineyard owner, realizing the unsuitability of his soil for the wheel-driven spray pump in October, has already expressed his intention to adopt a motor-driven pump placed on a sledge.

WHAT IS REALLY REQUIRED.

Spraying is something quite new to most of our vine-growers. As experience is gained in the work, modifications and improvements will no doubt suggest themselves. In the meantime, much can be learnt

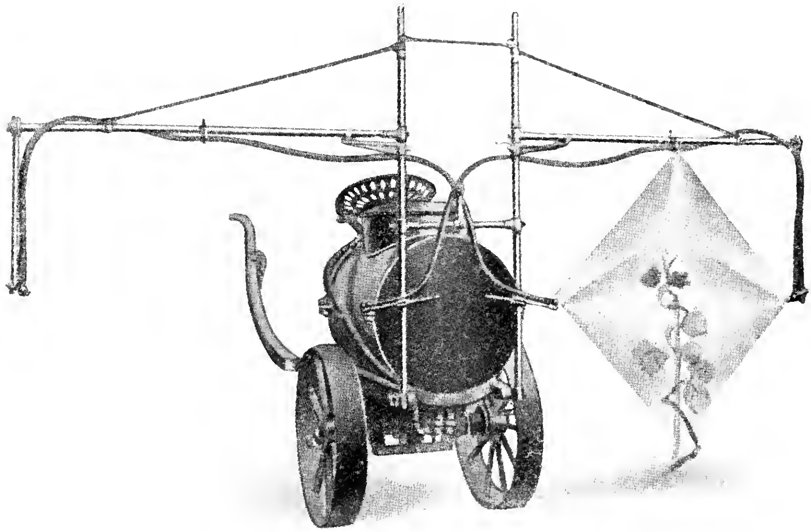


Fig.—19.—Vermorel's Traction Machine, "Le Priam" (after Bourcart.)

from our great Ally, France, to whom the world is already indebted for the solution of the phylloxera problem. The foregoing is largely based on information derived from French sources. It must be borne in mind, however, that our vineyards differ a good deal from those of Europe; local conditions, both climatic and cultural, must be taken into consideration. It is hoped that the present article, which deals with principles rather than matters of detail, may prove of service to those now making provisions for spraying their vineyards next spring.

Even in France, modifications in certain directions seem to be desirable, as will be seen from the following extract from an article on Mildew by Professor Ravaz.*

* *Progrès Agricole*, 12th August, 1917.

Under the sub-heading "We need different machines," he comments on the scarcity of labour needed to treat with the desired rapidity.

"For the first two treatments there is no trouble,* but for the third and subsequent ones, the leaf surface to be treated is considerable. To thoroughly wet a vine our workmen easily take twenty to thirty seconds. This is too much; and it is too much because our machines have too small an output. We need spray pumps which can empty themselves two or three times as fast—in other words, nozzles with an output two or three times as great. These do not seem to be difficult to realize. Neither have our machines for work on a large scale a sufficient output. A *dos de*

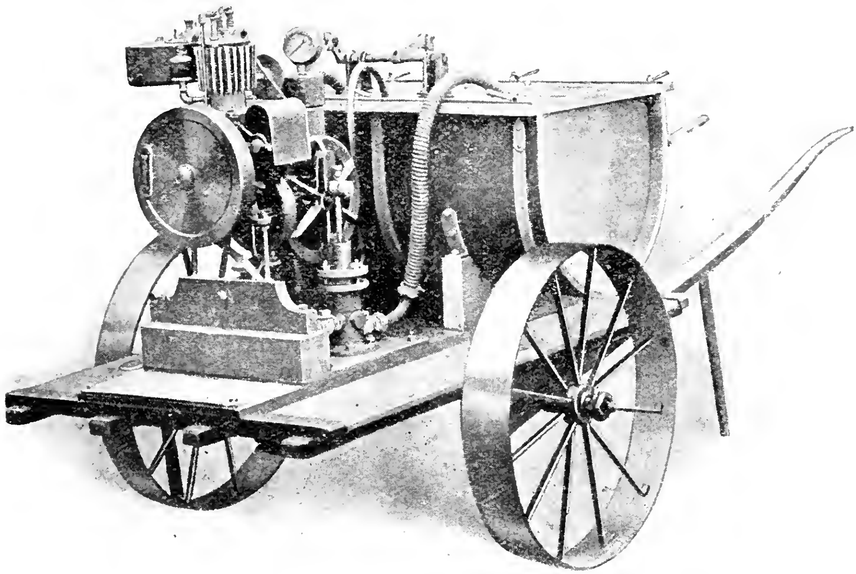


Fig. 20.—Langwill Brothers and Davies' motor-driven Potato Sprayer. The boom supporting the nozzles, which is fixed behind the engine, is not shown in the illustration.

mulet (pack-horse outfit) sprays about four hectolitres per hectare (40 gallons per acre). If it sprays more it is because the horse advances too slowly—similarly with wheeled machines. With knapsack sprays, the third, fourth, and fifth applications use 8 to 12 hectolitres per hectare (80 to 120 gallons per acre). Our larger machines should be able to distribute this same bulk at a horse's ordinary pace. Our constructors, if they are in a position to do so at present, should follow up this trail. It is a question of nozzle and of pressure, which seems to me to be of easy solution."

From the above will also be gathered some information as to the quantity of spray mixture required per acre under varying conditions. Allowance must, however, be made for the closer planting of Southern

* These will be found the most vital ones in Victoria.

French vines—5 feet x 5 feet, as a rule, though occasionally 7½ feet x 4 feet—in other words, from two or three times as many vines per acre as in our vineyards.

The following are some of the main requirements which must be filled by an efficient vineyard traction sprayer:—

Easy adjustability of nozzles, and of the boom to which these are affixed; this is amply provided for in the Perras machine. (See Figs. 16, 17 and 18). The arrangement must be such that the number and position of the nozzles can be varied in numerous ways. The adjustment will want to be quite different for the first spraying to what would be required for subsequent ones. The arrangement shown in Fig. 19 would be more suitable for early than late spraying; by fixing the two nozzles fairly low down, and giving them an upward cant, under-side spraying, as recommended by some, for the first treatment, can be realized.

Sufficient pump power.—This must be such as to provide ample pressure. It is the high pressure obtainable with motor-driven pumps that makes them so popular with orchardists.

Pressure and output must be adjustable.—The second of these depends largely on nozzle aperture, but not entirely so; it also depends on pressure. The same output, for example, would be obtained with small aperture and high pressure as with a larger aperture and lower pressure; the spray would be much finer in the former case. Though fineness of spray is generally most desirable, there are cases in which it may be excessive. In windy weather, for example, an exceedingly fine spray, excellent on a calm day, would be too easily blown away and much of it wasted by wind. Under such circumstances, a rather coarser spray, obtainable with larger aperture and lower pressure, would be more suitable. In several nozzles, the aperture is contained in a small, removable metal disc, which can be quickly changed. Instead of one large nozzle at any given point, it may be preferable to use two or more small ones.

Agitation must be sufficient to keep sediment constantly in suspension.

Lightness.—Unnecessary weight must be eliminated wherever possible. It is in a wet season that spraying is most vitally necessary; in a season, in short, when the soil of the vineyard is worst adapted for vehicular traffic. The quantity of liquid carried must be considerable, so as to reduce loss of time entailed by too frequent filling of the reservoir; this should have a capacity of at least 50 gallons—say, enough to spray an acre.* In this alone we have a load of 500 lbs., to which must be added the weight of pump, air chamber, &c.

Solidity.—A most necessary condition in all machines of the kind. Though lightness is essential, solidity must not be sacrificed to it.

Adaptability to the distance between the rows.—A machine suited for rows 10 feet apart would be useless in the narrower rows (5 to 6 feet intervals) of cooler districts. It is, nevertheless, advantageous to have as wide a wheel base as the interval between the rows will permit, so that the sprays will be deflected from their proper position as little as possible in the necessarily rough ground of a vineyard. In some American machines the distance between the wheels is adjustable.

* This is an average: the first spraying will take less and the later ones more than this quantity.

THE GOVERNMENT RED POLL DAIRY HERD.

On account of pressure on space, the publication of the annual report concerning the Government Herd of Red Poll Dairy Cattle for the year ending 30th June, 1917, has been delayed.

The herd continues to maintain its excellent production, and both individual performances and averages compare favorably with past years, despite the difficulty of maintaining a high average with increasing numbers; and despite, also, that a number of the old cows which have helped to maintain high averages in previous years have been passed out of the herd. Indeed, some of the younger cows have quickly forced their way towards the top, and bid fair to eclipse the performances of those older cows which first brought the herd into prominence.

The demand for bull calves has been beyond all possibility of being met, and scores of intending purchasers have had to be refused. On the 30th June last, when no less than 37 bull calves had been booked ahead of calving, it became necessary to stop booking, and it is regretted that so many will have to be disappointed before the taking of orders can be resumed.

Muria is again the leading cow, with 12,101 lbs. of milk, of 5.52 test, yielding 669 lbs. of butter fat during twelve months. Although this falls considerably short of the record of two years ago, when she beat all records for Red Polls, and all records for any breed in Australia or New Zealand, it is, nevertheless, a very creditable performance, since it followed on a premature calving—two months ahead of normal time.

Nicotine has established himself as a reliable sire of producers; and the four heifers by him which are included in this year's records, viz., Goldlace (ex Goldleaf), Avesia (ex Birdseye), Cutty (ex Connecticut), and Mahratta (ex India), have the splendid average for a first lactation period of 700 gallons of milk, 340 lbs. butter fat, and 388 lbs. commercial butter. This sire will assuredly help to maintain the high testing qualities of the herd, as these first four heifers of his gave an average composite test of 4.89.

The merit of Nicotine's sire, Acton Dewstone, imported by Major Philip Charley, is emphasized by the splendid performances of the females sired by him that are in the Werribee herd, notably, Panama, Ontario, Soudana, Congo, Japana, and Carribea, all of which have exceeded 300 lbs. butter fat.

No heifers by the imported bulls, Longford Major or Belligerent, have yet been milked, but, considering the milking excellence of their female ancestry, and the opportunity they have with the cows in the Werribee herd, the greatest confidence is felt that their influence will be in the direction of still further enhancing its dairying power. Longford Major is likely to impart size, and beef quality as well. He has grown into a massive bull, and, in September last, when not by any means as prime as he could be made, scaled within 14 lbs. of a ton. It is safe to say he could be easily brought to 2,500 lbs. if it was required.

YIELDS AND RETURNS OF THE GOVERNMENT HERD OF RED POLL DAIRY CATTLE.

Season 1910–11.

Cows (2nd Calf).

Name.	Days in Milk.	Weeks in Milk.	Milk in lbs.	Tests.	Butter Fat (lbs.)	Commercial Butter (lbs.)	Values.		
							£	s.	d.
Bullion	283	40½	7,730	4·2–5·0	356·71	406½	17	16	8
Virginia ..	283	40½	6,362	3·8–4·6	254·75	290½	12	14	9
Havana ..	283	40½	5,750	3·8–4·6	229·97	262¼	11	10	0
Kentucky ..	245	35	5,310	4·0–4·6	225·98	257½	11	6	0
Cigarette ..	238	34	5,040	4·0–4·6	211·61	241¼	10	11	7
Beulah	135	19¾	3,970	4·2–4·9	200·44	228½	10	0	5
Average for 6 ..	244½	30	5,693⅔	4·3	246·59	281	12	4	11

Heifers.

Name.	Days in Milk.	Weeks in Milk.	Milk in lbs.	Tests.	Butter Fat (lbs.)	Commercial Butter (lbs.)	Values.		
							£	s.	d.
Vuelta	270	38½	5,560	7·0–7 8	405·14	461¾	20	5	1
Connecticut ..	283	40½	6,182	4·2–4·6	269·06	306¾	13	9	0
Carolina ..	283	40½	5,700	4·2–4·8	253·14	288⅓	12	13	1
Muria	283	40½	5,480	4·2–6·2	240·70	274¼	12	0	8
Cuba	283	40½	5,260	4·2–4·8	231·89	264¼	11	11	11
Pennsylvania ..	270	38½	4,610	4·0–4·4	189·75	216¼	9	9	9
Average for 6 ..	278⅔	34	5,465	4·7	269·94	300·12	13	4	11

Season 1911–12.

Cows.

Name.	Days in Milk.	Weeks in Milk.	Milk in lbs.	Average Test.	Butter Fat (lbs.)	Commercial Butter (lbs.)	Values		
							£	s.	d
Vuelta	289	41¼	7,750	5·2–8·2	485·1	553	24	5	1
Connecticut ..	283	40½	6 780	4·6–6·4	364·0	415	18	4	0
Bullion	305	43½	6,940	4·8–6·2	344·0	392¼	17	4	0
Beulah	278	39¾	6,460	4·9–6·4	342·0	390½	17	2	7
Cuba	304	43½	7,015	4·4–8·4	337·8	385	16	17	9
Cigarette ..	291	41½	6,480	4·0–5·6	285·9	326	14	6	0
Sumatra ..	293	42	6,660	4·0–5·0	284·2	324	14	4	1
Kentucky ..	277	39½	6,690	4·0–4·8	277·7	316½	13	17	8
Muria	286	41	5,800	4·5–7·0	275·7	314¼	13	15	8
Pennsylvania ..	318	45½	6,340	4·0–5·2	271·9	310	13	12	0
Carolina ..	226	32¼	5,800	4·0–5·0	254·3	280	12	14	4
Virginia.. ..	277	39½	5,510	3·9–4·6	221·7	252¾	11	1	9
Havana ..	262	37½	5,350	3·8–4·5	215·3	245½	10	15	4
Average for 13	283	40½	6,355	4·7	304·6	346¼	15	4	7

Season 1912–13.

Cows.

Name.	Days in Milk.	Weeks in Milk.	Milk in lbs.	Tests.	Butter Fat (lbs.)	Commercial Butter (lbs.)	Values.
							£ s. d.
Muria	256	36½	5,780	4·5–7·3	314·96	359	15 15 0
Bullion . ..	239	34	6,490	3·8–6·8	296·90	333½	14 16 10
Egypta	295	42	6,581	3·7–5·2	283·5	323	14 3 6
Virginia.. ..	259	37	6,500	3·6–5·7	282·56	322	14 2 6
Cigarette ..	273	39	6,810	3·9–4·8	278·56	317½	13 18 6
Connecticut ..	320	45¾	6,100	4·0–7·6	277·85	316¾	13 17 10
*Vuelta ..	263	37½	6,650	3·5–5·3	273·81	312	13 13 9
Cuba	251	36	6,280	3·9–5·4	269·11	306¾	13 9 1
Kentucky ..	267	38	6,249	3·4–4·4	256·00	291¾	12 16 0
Havana ..	258	37	6,060	3·5–5·5	252·95	288¼	12 12 11
Sumatra ..	230	33	5,670	3·7–5·5	238·37	171¾	11 18 4
Pennsylvania ..	230	34¼	4,910	3·8 5·9	215·09	245¼	10 15 0
Europa	324	46¼	4,590	3·6–7·1	201·13	229¼	10 1 1
Carolina ..	274	39	4,450	3·6–6·5	198·30	226	9 18 3
Average for 14 Cows ..	267	38	5,942	4·85	259·94	295	12 19 10

* Suffered from eye accident for a considerable period

Heifers.

Name.	Days in Milk.	Weeks in Milk.	Milk in lbs.	Average Test.	Butter Fat (lbs)	Commercial Butter (lbs.)	Values.
							£ s. d.
Goldleaf ..	287	41	6,590	4·1–5·3	316·50	360	15 16 6
Birdseye ..	285	41	4,440	3·9–8·0	256·75	292½	12 16 9
India	267	38	5,231	4·1–6·2	238·37	271½	11 18 1
Persica	252	36¼	4,100	4·6–7·7	218·69	249¼	10 18 8
Turka	191	27½	3,590	4·6–5·9	178·27	203¼	8 18 3
Mexicana ..	210	30	3,830	4·0–5·1	171·58	195½	8 11 6
Regalia ..	338	48¼	3,380	4·4–6·0	161·58	184¼	8 1 0
Cabana	273	39	3,370	4·0–5·4	153·23	174½	7 13 3
La Suelta ..	241	34½	2,660	4·3–8·2	134·23	153	6 14 3
Average for 9 Heifers ..	260	37	4,132	5·3	203·24	232	10 3 3

Season 1913–14.

Cows.

Name.	Days in Milk.	Weeks in Milk.	Milk in lbs.	Average Test.	Butter Fat (lbs.)	Estimated Butter (lbs.)	Values.
							£ s. d.
Cigarette ..	328	46¾	9,414¼	4·12	388·25	442½	19 8 3
Muria	296	42¼	7,487¼	5·08	380·25	433½	19 0 3
Birdseye ..	297	42¼	6,542¾	5·48	358·75	409	17 18 9
Virginia ..	304	43½	8,229	4·33	356·75	396¾	17 16 3
Bullion	297	42½	8,177¾	4·29	350·75	400	17 10 9
Sumatra ..	330	47¼	7,605	4·26	323·75	368¼	16 3 0
Vuelta	286	43¾	7,723½	4·14	320	364¾	16 0 0
Connecticut ..	278	39¾	7,166	4·47	318·25	362¾	15 18 3
Persica	298	42½	6,954¼	4·57	318	362½	15 18 0
Kentucky ..	288	39¾	7,904½	3·96	313·25	357	15 13 3
Goldleaf ..	277	41	6,908	4·49	310·25	353½	15 10 3
Mexicana ..	293	41	6,773¾	4·56	309·25	352½	15 9 3
Cuba	287	41¾	6,624¼	4·47	296·25	337¾	14 16 3
Europa	302	43	6,273	4·60	289·25	329¾	14 9 3
Egypta	288	41	6,724	4·13	277·75	316¾	13 17 9
India	245	35	6,150	4·36	268·5	306	13 8 6
Havana ..	240	34¼	6,364½	4·15	264·25	301¼	13 4 3
Turka	289	41¼	5,534¼	4·69	259·75	296	12 19 9
Asiana	260	37	4,249¾	5·30	225·5	257	11 5 6
Pennsylvania ..	249	35½	5,160	4·4	212·25	242	10 12 3
Regalia	297	42½	4,444	4·50	200·25	228¼	10 0 3
Carolina ..	231	33	4,322½	4·62	200·25	228¼	10 0 3
Averages of herd of 22 cows ..	284¾	40¾	6,669¾	4·49	297·25	338½	14 17 3

Season 1913-14—*continued.*

Heifers.

Name.	Days in Milk.	Weeks in Milk.	Milk in lbs.	Average Test.	Butter Fat (lbs.)	Commercial Butter (lbs.)	Values.
							£ s. d.
Atlanta ..	300	42¾	5,505¼	4·90	277	315¾	13 17 0
Germania ..	359	51¼	4,218¼	4·74	199·75	227¾	9 19 9
Arctica ..	294	42	3,768¼	5·16	194·5	221¾	9 14 6
Netherlana ..	293	41¾	4,551¼	4·18	190·5	217¼	9 10 6
Hispana ..	290	41½	3,944½	3·95	155·75	177½	7 15 9
Melanesia ..	276	39½	3,690½	3·97	146·5	167	7 6 6
Averages for 6 heifers ..	302	43¼	4,279¼	4·48	194	221	9 14 0

Season 1914-15.

Cows.

Name.	Days in Milk.	Weeks in Milk.	Milk in lbs.	Average Test.	Butter Fat (lbs.)	Commercial Butter (lbs.)	Values.
							£ s. d.
Muria	365	52	14,972	5·9	884·6	1,007·94	44 4 7
Persica ..	351	50	9,607	4·9	479·94	547·13	23 19 11
Cuba ..	337	48	10,464	4·5	478·14	545·07	23 18 1
Birdseye ..	321	45¾	8,522	5·5	473·79	540·12	23 13 9*
Bullion ..	321	45¾	10,928	4·3	468·99	534·64	23 8 11
Virginia ..	344	49	10,252	4·4	456·76	520·13	22 16 9†
Pennsylvania ..	348	49½	10,607	4·1	437·42	498·65	21 17 5
Sumatra ..	290	41¼	9,232	4·6	431·49	491·89	21 11 6
Egypta ..	327	46¾	10,646	3·9	418·55	477·14	20 18 6
Mexicana ..	282	40¼	8,641	4·6	399·75	455·71	19 19 9
Europa ..	347	49½	8,765	4·4	387·11	441·30	19 7 1
Goldleaf ..	362	51½	8,415	4·4	377·67	430·54	18 17 8
Phillipina ..	284	40½	6,829	5·0	343·33	391·39	17 3 4
Vuelta ..	239	34	7,560	4·4	338·28	385·64	16 18 3
Connecticut ..	259	36¾	6,878	4·7	325·48	371·04	16 5 6
Turka ..	279	39¾	6,395	4·9	316·07	360·31	15 16 0*
Ardath ..	332	47¼	6,261	4·8	302·91	345·31	15 2 10
Asiana ..	279	39¾	5,933	4·9	292·01	332·62	14 12 0
Netherlana ..	292	41½	6,903	4·2	291·78	332·62	14 11 9
Havana ..	325	46½	7,001	4·0	285·86	325·88	14 5 10†
Cameo ..	303	43¼	5,536	5·1	285·60	325·58	14 5 7
Alpina ..	286	40¾	6,995	3·9	276·86	315·62	13 16 10
Atlanta ..	252	36	5,635	4·7	266·90	304·26	13 6 10
Hispana ..	365	52	6,574	3·6	241·69	275·52	12 1 8
Kentucky ..	281	40	6,068	3·9	239·51	273·04	11 19 6†
India ..	244	34¾	4,578	4·9	225·30	252·75	11 5 3
Averages of herd of 26 cows ..	308	43¾	8,084½	4·6	374·03	426·39	18 14 0

* Was sick a few days. † Suffered from lameness.

Heifers.

Name.	Days in Milk.	Weeks in Milk.	Milk in lbs.	Tests.	Butter Fat (lbs.)	Commercial Butter (lbs.)	Values.
							£ s. d.
Pipio	334	47½	6,802	4·8	326·37	372·06	16 6 4
Tennessee ..	311	44¼	6,706	4·2	282·88	322·48	14 2 10
Samorna ..	365	52	5,490	4·9	271·76	309·80	13 11 9
La Reina ..	342	48¾	5,070	5·1	261·96	298·63	13 1 11*
Mongolia ..	301	43	5,799	4·2	244·95	279·24	12 4 11
Sylvia ..	301	43	4,897	4·7	235·79	268·80	11 15 9
Tuckahoe ..	322	46	4,374	4·7	206·38	235·27	10 6 4
Averages of herd of 7 heifers ..	325	46¼	5,591	4·6	261·44	298·04	13 7 1

* Calved two months prematurely.

Season 1915–16.

Cows.

Name of Cow.	Days in Milk.	Weeks in Milk.	Milk in lbs.	Average Test.	Butter Fat (lbs.)	Commercial Butter (lbs.)	Values, 1s. lb. Fat.
							£ s. d.
Birdseye ..	365	52	9,146	6·53	597	683	29 17 0
Netherlana ..	365	52	11,506	4·26	490	560	24 10 0
Violet III. ..	365	52	9,172	4·66	427	488	21 7 0
Phillipina ..	365	52	8,213	4·87	400	457	20 0 0
Connecticut ..	357	51	8,313	4·80	399	456	19 19 0
Persica	346	49	7,800	5·00	394	451	19 14 0
Lily	365	52	8,525	4·59	392	448	19 12 0
India	365	52	8,556	4·56	390	445	19 10 0
Cuba	324	46	8,400	4·55	382	437	19 2 0
Kentucky ..	338	48	9,893	3·86	382	437	19 2 0
Mexicana ..	310	44	8,421	4·44	374	427	18 14 0
Picotee	365	52	8,490	4·36	371	424	18 11 0
Vuelta	328	47	9,130	4·00	368	420	18 8 0
Sumatra ..	322	46	8,135	4·45	362	414	18 2 0
Ardath	365	52	7,339	4·84	355	406	17 15 0
Primrose League (Imp.) ..	365	52	8,060	4·39	353	403	17 13 0
La Reina ..	329	47	6,712	5·13	344	394	17 4 0
Bullion	317	45	7,504	4·40	330	377	16 10 0
Pennsylvania ..	278	40	8,236	4·00	330	376	16 9 0
Mongolia ..	283	40	7,483	4·33	323	369	16 3 0
Pipio	317	45	6,274	5·09	319	365	15 19 0
Britannia ..	329	47	7,637	3·94	301	343	15 1 0
Goldleaf ..	248	35	6,665	4·43	295	337	14 15 0
Samorna ..	365	52	6,198	4·75	294	336	14 14 0
Asiana	279	40	5,933	4·90	292	332	14 12 0
Egypta	303	43	7,136	4·02	287	328	14 7 0
Cameo	285	41	6,036	4·72	285	325	14 5 0
Alpina	344	49	7,094	3·99	283	323	14 3 0
Sylvia	303	43	5,286	4·84	256	292	12 16 0
Tennessee ..	347	50	5,914	4·17	246	281	12 6 0
Africana ..	303	43	5,082	4·72	240	274	12 0 0
Tasmania ..	325	46	5,112	4·52	231	264	11 11 0
Canada	275	39	4,918	4·07	200	228	10 0 0
Average for 33 cows ..	330	47	7,525	4·54	342	391	17 2 0

Butter fat at 1s. per lb., £17 2s.; milk at 8d. per gallon, £25 14s. 10d.

Heifers.

Name of Heifer.	Days in Milk.	Weeks in Milk.	Milk in lbs.	Average Test.	Butter Fat (lbs.)	Commercial Butter (lbs.)	Values, 1s. lb. Fat.
							£ s. d.
Carribea ..	365	52	7,142	4·35	310	354	15 10 0
Japana	357	51	7,788	3·63	283	322	14 3 0
Serbia	365	52	6,092	4·45	271	309	13 11 0
Itala	365	52	6,346	4·09	260	297	13 0 0
Oceana	365	52	6,247	4·11	256	292	12 16 0
Russia	365	52	6,413	3 96	254	290	12 14 0
Panama ..	288	41	5,997	4·23	254	290	12 14 0
Ontario ..	365	52	6,059	4·15	251	286	12 11 0
Soudana ..	346	49	5,486	4·54	249	284	12 9 0
Pacifica ..	365	52	4,979	4·88	243	278	12 3 0
Laurel	325	46	5,554	4·86	226	257	11 6 0
Barbery ..	359	51	5,387	3·72	200	228	10 0 0
Congo	296	42	4,449	4·21	187	213	9 7 0
Average for 13 heifers ..	348	50	5,995	4·03	242	277	12 2 0

Butter fat at 1s. per lb., £12 2s.; milk 8d. per gallon, £19 19s. 8d.

Season 1916 17.

Cows.

Name of Cow.	Days in Milk.	Weeks in Milk.	Milk in lbs.	Average Test.	Butter Fat (lbs.)	Commercial Butter (lbs.)	Values.
							£ s. d.
Muria	365	52	12,101	5·52	669	763	33 9 0
Sumatra ..	365	52	11,569	4·46	516	588	25 16 0
Panama ..	365	52	10,830	4·33	469	535	23 9 0
Tennessee ..	310	44	9,107	4·26	389	443	19 9 0
Ontario ..	365	52	9,685	3·99	387	441	19 7 0
Soudana ..	365	52	8,788	4·38	385	439	19 5 0
Primrose League (Imp.) ..	365	52	8,698	4·08	356	405	17 16 0
Europa ..	353	50	7,899	4·43	350	399	17 10 0
Congo	357	51	8,252	4·23	349	398	17 9 0
Pipio	287	41	7,887	4·42	348	397	17 8 0
Asiana ..	357	51	7,356	4·71	346	395	17 6 0
Phillipina ..	298	43	7,295	4·73	345	394	17 5 0
India	365	52	8,065	4·27	344	392	17 4 0
Japana ..	365	52	10,101	3·40	343	391	17 3 0
Europa ..	295	42	7,618	4·49	342	390	17 2 0
Mexicana ..	273	39	8,549	3·98	341	389	17 1 0
Velveteen (Imp.)	365	52	7,887	4·25	336	382	16 16 0
Vuelta ..	273	39	7,914	4·18	330	377	16 10 0
Tasmania ..	358	51	7,576	4·30	326	371	16 6 0
Carribea ..	304	43	7,719	4·20	324	370	16 4 0
La Reina ..	299	43	6,677	4·78	319	364	15 19 0
Cuba	259	37	7,508	4·17	313	357	15 13 0
Goldleaf ..	351	50	7,311	4·19	307	350	15 7 0
Britannia ..	308	42	7,309	4·30	301	344	15 1 0
Sylvia	261	37	6,180	4·80	297	338	14 17 0
Egypta ..	303	43	7,293	4·03	294	335	14 14 0
Arpina ..	286	41	7,440	3·84	286	326	14 6 0
Americana ..	319	46	5,925	4·60	272	310	13 12 0
Australiana ..	338	48	5,652	4·77	270	308	13 10 0
Canada ..	286	41	6,688	4·02	269	307	13 9 0
Egypta ..	282	40	6,825	3·90	266	304	13 6 0
Barbery ..	280	40	6,638	3·99	265	302	13 5 0
Laurel ..	323	46	6,257	3·70	232	264	11 12 0
Tabelta ..	330	47	4,867	4·42	215	245	10 15 0
Africana ..	243	35	4,482	4·59	206	235	10 6 0
Hispana ..	270	39	5,656	3·61	201	230	10 1 0
Zealana ..	201	29	2,817	3·65	103	117	5 3 0
Averages, 37 cows ..	316	45	7,580	4·28	325	370	16 5 0

Heifers.

Name of Heifer.	Days in Milk.	Weeks in Milk.	Milk in lbs.	Average Test.	Butter Fat (lbs.)	Commercial Butter (lbs.)	Values.
							£ s. d.
Gallipoli ..	365	52	8,074	4·44	359	409	17 19 0
La Belle France..	365	52	7,765	4·61	359	409	17 19 0
Goldlace ..	319	46	7,502	4·61	346	395	17 6 0
Tonga ..	338	48	7,397	4·61	341	389	17 1 0
Avesia ..	340	49	7,406	4·59	340	388	17 0 0
Cutty	358	51	7,012	4·76	334	381	16 17 0
Mahratta ..	347	50	6,043	5·61	339	387	16 19 0
Aridia	275	39	4,217	4·89	206	235	10 6 0
Averages, 8 heifers ..	338	48	6,927	4·73	328	374	16 8 0

Cows—Butter fat at 1s. per lb., £16 5s.; milk at 8d. per gallon, £25 5s. 4d.
Heifers—Butter fat at 1s. per lb., £16 8s.; milk at 8d. per gallon, £23 1s. 9d.
Cows—325 lbs. fat.
Heifers—328 lbs. fat.

STANDARD TEST COWS.

REPORT FOR QUARTER ENDED 31ST DECEMBER, 1917.

The cows completing the term number 37, of which only two failed to secure certificates.

DEPARTMENT OF AGRICULTURE, Werribee. (Red Poll.)

Completed since last report, 11. Certificated, 10.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Samotina ..	Not yet allotted	31.12.16	7.1.17	273	20	6,350	4·82	306·30	175	349½
Empire	..	10.1.17	17.1.17	273	12½	5,180	4·77	247·15	200	281¾
Aleutia	..	18.1.17	25.1.17	273	19½	7,033	4·35	306·08	250	349
Briar	..	31.12.16	7.1.17	273	13½	5,779	4·40	254·44	175	290
Opticia	..	30.1.17	6.2.17	273	22	7,914	4·32	341·88	175	389¼
Arridia	..	5.2.17	12.2.17	273	9½	6,345	4·32	274·44	200	312¾
Sumonta	,,	16.2.17	1.3.17*	273	22	6,725	4·22	284·25	175	324
Cutty	,,	24.2.17	2.3.17	273	21½	8,351	4·64	388·18	200	442½
Tropic	,,	5.3.17	12.3.17	273	10½	5,717	4·35	248·91†	175	283¾
Congo	,,	20.3.17	27.3.17	273	17½	6,103	4·19	255·74	250	291½

* Entry deferred 6 days owing to injured udder.
† Suffered from bad udder for last five months.

E. HAYES, Archie's Creek. (Jersey.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Nanette	Not allotted	4.2.17	11.2.17	273	11	4,658	4·95	230·40	200	262¾

A. JACKSON, Glen Forbes. (Jersey.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Lady's Maitland	423 C.S.J.H.B.	11.2.17	18.2.17	273	17	5,521	5·60	309·27	175	352½

C. D. LLOYD, Caulfield. (Jersey.)

Completed since last report, 2. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Whitebread ..	4244	11.3.17	18.3.17	273	24	6,786	5·40	366·61	175	418
Dainty Molly ..	2830	15.3.17	22.3.17	273	19	5,293	6·05	320·33	250	365

C. GORDON LYON, Heidelberg. (Jersey.)

Completed since last report, 8. Certificated, 8.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Ettle IV. ..	2889	28.12.16	4.1.17	273	28½	9,813	4·34	426·17	250	485¾
Lassle II. ..	1136	31.12.16	7.1.17	273	19½	7,539	4·78	360·92	250	411½
Statuette ..	4251	8.1.17	15.1.17	273	20½	6,816	5·76	392·62	250	447½
Lassle	509	18.1.17	25.1.17	273	11½	5,356	5·17	276·85	250	315½
Silvermine XIV. ..	Not allotted	5.2.17	12.2.17	273	21½	6,067	4·95	300·14	175	342¼
Starfinch II. ..	2915	7.3.17	14.3.17	273	11½	5,473	4·95	271·25	250	309¼
Noble Jessie ..	2843	14.3.17	21.3.17	273	11½	5,575	5·67	316·59	250	361
Hawthorn IV. ..	Not allotted	27.3.17	3.4.17	273	13½	4,998	6·10	304·90	175	347½

T. MESLEY, Dalyston. (Jersey.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Lily Langtry ..	Not allotted	7.1.17	14.1.17	273	15½	5,391	5·91	318·69	250	363¼

J. D. READ, Springhurst. (Jersey.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Nightshade ..	3707	22.3.17	29.3.17	273	25	8,477	4·93	418·51	250	477

MISS S. L. ROBINSON, Malvern. (Jersey.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Twinkle ..	538 C.S.J.H.B.	5.3.17	12.3.17	273	20	5,468	4·92	269·49	250	307¼

G. ROWE, Kardella. (Jersey.)

Completed since last report, 1. Certificated, 0.

W. WOODMASON, Malvern. (Jersey.)

Completed since last report, 12. Certificated, 10.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Jenny Lind VI. of Melrose	3649	30.12.16	6.1.17	273	13½	6,112	4·73	289·16	250	329¾
Flower IX. of Melrose	Not allotted	31.12.16	7.1.17	273	15½	3,668	5·48	201·15	175	229¼
Pearl V. of Melrose	,,	31:12.16	7.1.17	273	14	4,126	5·68	234·41	175	267¼
Rarity VI. of Melrose	3675	1.1.17	8.1.17	273	21½	8,839	5·10	450·57	250	513¾
Pleasance V. of Melrose	4527	4.1.17	11.1.17	273	10½	4,914	5·54	272·51	250	310¾
Mates V. of Melrose	4524	5.1.17	12.1.17	273	22	6,652	5·26	350·25	250	399¼
Fuchsia X. of Melrose	4516	12.1.17	19.1.17	273	16½	7,473	4·66	348·31	250	397
*Edith V. of Melrose	4513	16.1.17	23.1.17	273	14½	5,466	5·15	281·64	250	321
Jessie XVI. of Melrose	Not allotted	19.1.17	26.1.17	273	13½	4,207	6·83	287·54	175	327¾
Peerless of Melrose III.	2817	1.3.17	8.3.17	273	11½	5,566	5·20	289·59	250	330¼

* For her two previous lactation periods, this cow's name appeared as Edith II.

TEACHERS' SCHOOL AT BURNLEY, 1918.

Though to-day the school teacher is not such an outstanding character in our world that we wonder that one small head can carry all he knows, still it is necessary for him who would be successful in his work to be, as an English assayist has said, "superficially omniscient." In addition to his equipment for instructing the youth in every-day educational subjects, it is desirable that he should have a passing acquaintance with the several sciences. A knowledge of botany or metallurgy may, perhaps, afford a method of inculcating something useful, a talent for astronomy will help him to transport his pupils from the sphere of grammar and arithmetic to a wider world, and an acquaintance with agricultural science will often enable the country teacher to give many a practical lesson. Various avenues are open to the city teacher by which to obtain this technical knowledge, but the country pedagogue must usually acquire it in his leisure from text books without the aid of guide or friend.

In September, 1915, the Department of Agriculture arranged a course of lectures on agricultural subjects at the State Research Farm at Werribee. These lectures extended over five days, and were attended by seventy country teachers. In January, 1917, a somewhat similar course was delivered at the same place.

This year, the Burnley School of Primary Agriculture was chosen, in order that instruction in practical fruit-growing might be given. The course, which was attended by twenty-three teachers from country districts, lasted eight days, which means that those attending sacrificed at least eight days of their vacation.

The classes were formally inaugurated on the 21st January. In the absence of the Minister of Agriculture, Dr. Cameron, Director of Agriculture, presided, and, in welcoming both visitors and teachers, remarked that agriculture in some form is now being taught in 700 schools in Victoria.

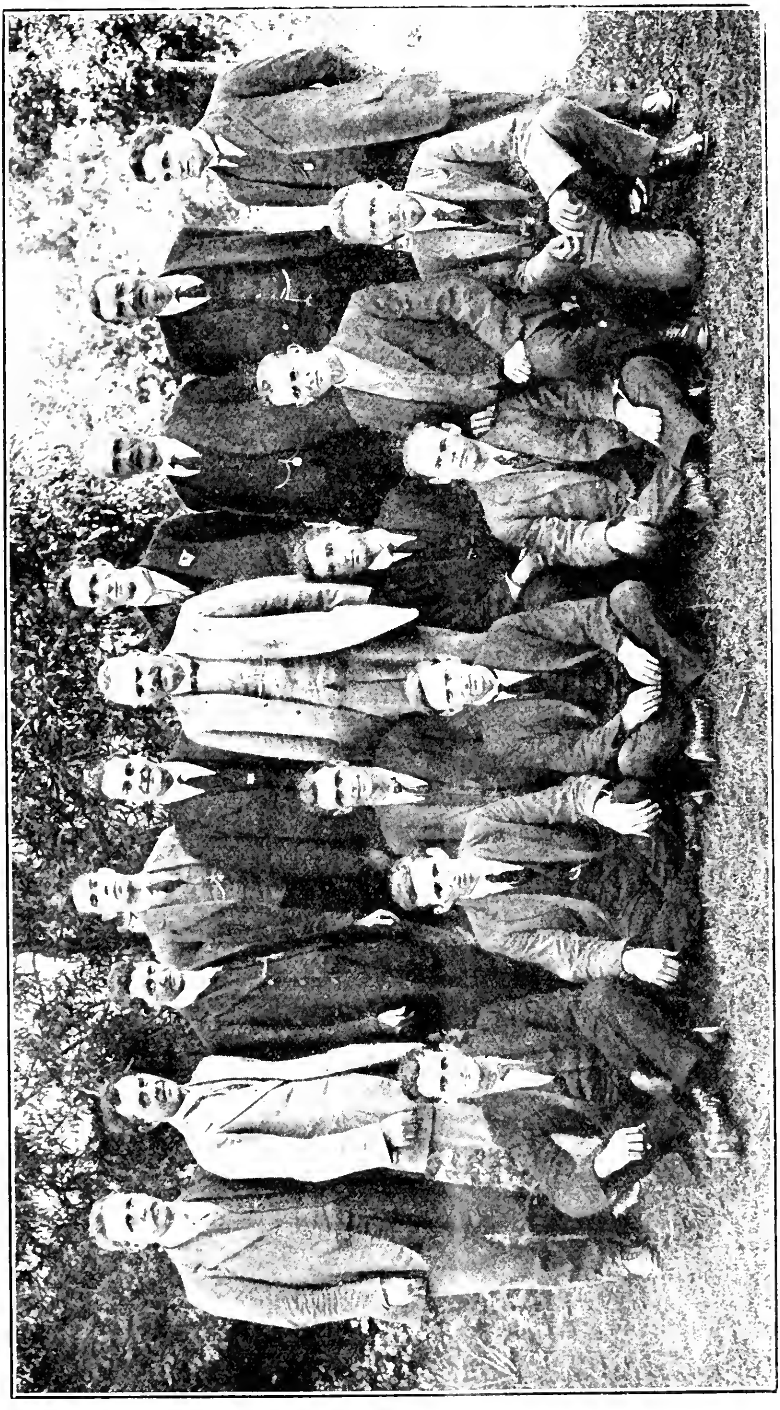
His Excellency the Governor-General, Sir R. M. Ferguson, in a short speech, stressed the importance of securing, especially at this juncture in the world's history, better methods of agricultural production and marketing. In this respect Australia could learn much from the more closely settled countries. His Excellency characterized the Burnley gardens as one of the beauty spots of the metropolis, and expressed the opinion that they should be linked up with the Botanical Gardens and Richmond Park by inclusion in the Yarra improvement scheme.

Short addresses were also delivered by the Minister of Education, Major Baird, M.L.A.; and the Director of Education, Mr. Frank Tate.

During the period of the school, in addition to practical demonstrations in pruning in the orchard, lectures were delivered on the following subjects:—

Climate and soil conditions required for different classes of fruit.

Choice of trees for production of fruit for the table, canning and drying.



A Group of Teachers who attended the recent school at Burnley, with Mr. J. P. McLennan, Principal of the Burnley School of Horticulture.

Methods of propagation of fruit trees.
Preparation and planting of orchards.
Picking, packing, and marketing of fruit.
Principles of pruning.
Cost of production of fruit.
Drying and canning of fruit.
Spraying of orchards.
Citrus fruits and their culture.
Propagation of the vine.
Diseases of the vine.
Soils and soil fertility.
Principles of manures and manuring.
Irrigation and irrigation methods.
Fungus diseases and insect pests.
Trees for shelter belts.

Unlike the "schools" held at the State Research Farm, that at Burnley was one of instruction, and nothing more, the only social event in the course beingg the occasion of the formal opening. It was intended that a visit should have been made to one of the fruit-growing districts near Melbourne; but even this small recreation was abandoned, and those attending the Burnley "session" will remember it as one that was not diversified by anything outside the range of practical work.

WHEAT VARIETY TESTS.

Results, 1917-18.

By H. A. Mullett, B. Ag. Sc.

For Accurate Results, Careful Experimental Work Necessary.

Of the many field problems that beset the wheat farmer, those connected with cultural and manurial practices, as well as those relating to seed, are, perhaps, of most importance. Their solution is of perennial concern to the practical man. Striking differences in yields are frequently noted on the farm, but usually it is difficult to state definitely the reason of these variations. To solve such problems effectively it is necessary to grow the wheat so that the disturbing factors which commonly affect the yield under ordinary farming conditions may be ascertained and eliminated. Thus, if it be desired to test the effect of a certain dressing of manure on the yield of a particular variety of wheat, the trial must be designed so as to insure that no disturbing elements, such as soil variation, differences in the time, depth and rate of sowing, &c., occur. Similar precautions must be taken when testing the comparative yields of different varieties.

The method generally adopted is to conduct the tests in small plots side by side in an even field. To minimize the soil variations it is usual to limit the size of each to half-an-acre or less, and in order that accurate calculations may be made the several plots are measured, and at harvest the actual weight of produce determined.

Object of Variety Trials at State Farms.

A portion of the permanent experiment fields at the Werribee, Wyuna, and Rutherglen Farms, and at Longerenong College is devoted to annual variety trials conducted in this way, generally 20 plots, each half-an-acre in area, being sown at each centre. The results provide a basis for a comparison of the yields of standard varieties of wheat, as well as those of any promising new varieties and crossbreds. The plots also form part of a scheme designed to systematically improve the bulk seed wheat sold to farmers. The steady improvement of the wheat so produced is insured by the process of hand selection which takes place prior to sowing in the variety plots, the produce of which, when tested, furnishes the seed for the bulk plots. All plots are sown on well-worked fallow with 60 lbs. seed and 112 lbs. superphosphate per acre.

Results of Variety Trials, 1917-18.

Longerenong.

Plots sown second week in June—Rainfall (May-October), 11.84 inches:—

	Bush. per acre.
New Crossbred, "Gallipoli"	50.5
Selected Federation	44.3
New Crossbred, Bobs x Federation (brown)	42.9
College Eclipse	42.8
New Crossbred, No. 48	42.7
New Crossbred, "Graham"	42.4
Major	42.2
Currawa	39.8
Bunyip	39.1
Yandilla King	38.1
Dart's Imperial	37.5

Wyuna.

Plots sown first week in June—Rainfall (May-October), 18.17 inches:—

	Bush. per acre.
Yandilla King	32.7
Federation, selected	30.6
Currawa	29.1
Penny	28.1
Major	28.3
New Crossbred, Bobs x Federation (brown)	27.7
New Crossbred, Redskin x Yandilla	24.7
New Crossbred, Indian 11 x Comeback	24.2
Warden	23.9
Dart's Imperial	23.7
New Crossbred "Gallipoli"	23.1
Marshall's No. 3	22.1
New Crossbred, Bobs x Federation (white)	21.0
New Crossbred, Stanley x Yandilla King	20.4
Gluyas	19.6
College Eclipse	17.1
King's Early	14.7

Werribee.

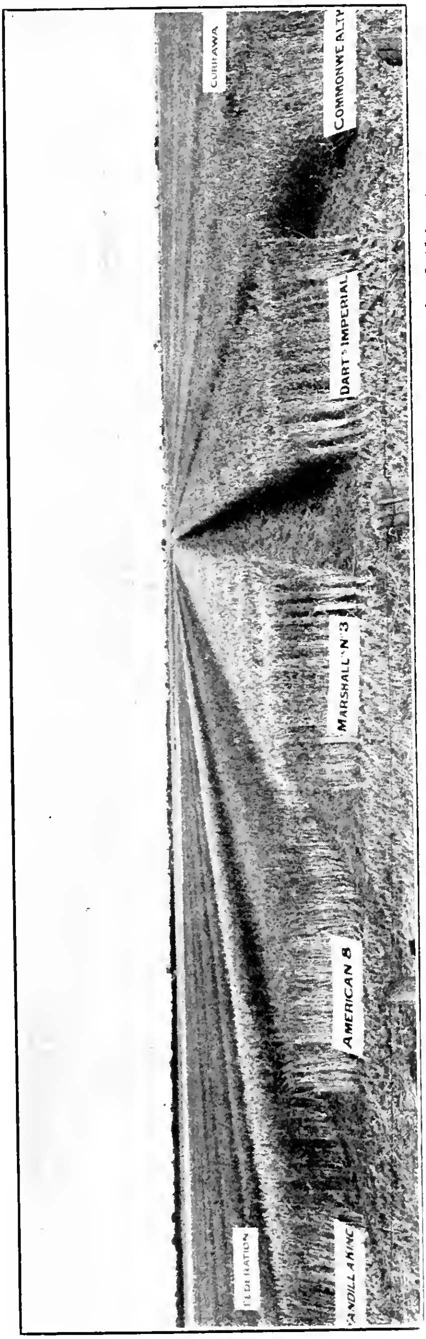
Plots sown first week in June—Rainfall (May-October), 10.5 inches:—

	Bush. per acre.
New Crossbred, Indian H x Telfords ..	29.0
New Crossbred, "Graham"	28.2
Marshall's No. 3	27.0
Yandilla King	26.6
New Crossbred, Indian E x Telfords ..	26.5
New Crossbred, Stanley x Yandilla King ..	26.5
Currawa	25.0
Major	23.9
New Crossbred "Gallipoli"	23.6
New Crossbred, Bobs x Federation (brown)	23.5
Federation	22.1
Dart's Imperial	21.7
New Crossbred, Redskin x Yandilla ..	21.6
Warden	21.2
Gluyas	21.1
New Crossbred, Bobs x Federation (white)	19.9
College Eclipse	19.8
Penny	19.8
Comeback	18.9
Thew	18.8
Bunyip	15.2
Mac's White	14.7

Rutherglen.

Plots sown first week in June—Rainfall (May-October), 24.11 inches:—

	Bush. per acre.
Warden	14.0
Federation (a special selection)	13.9
Major	13.3
New Crossbred, "Gallipoli"	13.2
New Crossbred, "Graham"	12.4
New Crossbred, Gluyas x Federation ..	11.9
Currawa	11.9
Yandilla King	11.8
Federation, selected	11.8
Marshall's No. 3	11.8
Penny	10.7
Dart's Imperial	10.4
Gluyas	10.2
New Crossbred, Stanley x Yandilla King ..	10.0
New Crossbred, Indian F x Federation ..	10.0
Federation (not selected)	9.8
Comeback	9.8
New Crossbred, Indian F x Federation, No. 2	9.6
College Eclipse	7.7
King's Early	7.4



View of Selection Plots at Wyuna. Hand selection is made when crop has attained this stage.

At two of the centres, viz., Rutherglen and Wyuna, the past season was remarkable for the exceedingly heavy rainfall experienced during the growing period of the wheat (May-October), and at the first-named place the yields suffered severely from excessive water.

The protracted growing period at Rutherglen, Werribee, and Wyuna has apparently suited the later maturing varieties, such as Yandilla King, Major, and Currawa; but at Longerenong, where the sowing was made a week later and the season was somewhat shorter, early varieties like College Eclipse, and mid-season varieties like Federation, have done better than at other centres. Ordinary Federation has not done so well this year, but selected Federation at Longerenong was second on the list with a yield of 44.3 bushels per acre, while at Rutherglen, where the yields were on a much lower scale all round, a special selection of Federation beat ordinary Federation by 4.1 bushels per acre.

Summarizing Results for Past Five Years.

No one can forecast a season with any certainty. Therefore, in ordinary circumstances, the wheat farmer should sow in anticipation of a normal season. The results of any one year, which, perhaps, has diverged from the normal, should not be accepted as an unquestionable indication of the best varieties for an average season. Rather should the mean results over a series of years be looked for as giving a more reliable guide.

Average Results, Quinquennial Period, 1913–17.

TABLE COMPARING THE YIELDS OF SEVERAL WELL-KNOWN VARIETIES FROM VARIETY PLOTS, WERRIBEE.

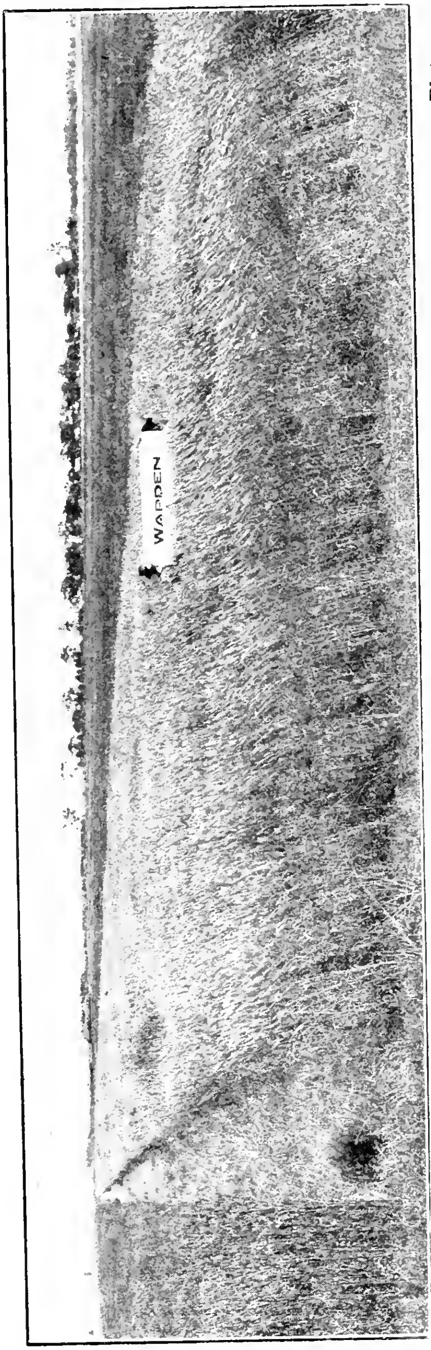
Variety.	Yield in Bushels per Acre.					Average Yield for Five Years.
	1913.	1914.	1915.	1916.	1917.	
Major	..	20·2	25·6	15·9	23·9	21·4
Currawa	..	18·2	23·2	12·2	25·6	19·6
Penny	..	22·3	25·1	9·6	19·6	19·1
Marshall's No. 3	13·3	18·7	25·1	10·1	27·0	18·8
Yandilla King	11·2	18·1	22·9	9·5	26·6	17·7
Dart's Imperial	13·2	16·5	22·8	9·8	21·7	16·8
King's Early	16·9	18·6	22·8	8·4	..	16·7
Federation	12·8	16·3	24·6	7·4	22·1	16·6
Gluyas	15·9	14·8	23·9	4·5	21·1	16·0

SELECTION PLOTS—LONGERENONG.

Variety.	Yield in Bushels per Acre.					Average Yield for Five Years.
	1913.	1914.	1915.	1916.	1917.	
Federation (Selected)	36·2	17·2	54·5	42·9	29·8	36·1
Federation (Ordinary) ..	24·6	5·0	49·5	42·0	30·4	30·3
Yandilla King	24·9	7·0	54·4	16·9	27·6	26·1
Dart's Imperial	30·0	11·9	45·5	10·7	21·3	23·9
Currawa	..	11·5	42·5	9·9	29·6	21·6
College Eclipse	..	12·2	42·9	26·6	28·6	22·1
Gluyas	24·7	9·5	45·1	Lodged	Not grown	..
King's Early	31·3	7·9	34·5	Lodged	Not grown	..
Major	..	..	54·4	36·7	28·6	Not grown sufficiently long
Penny	..	..	..	Not grown		

VARIETY PLOTS—RUTHERGLEN.

Variety.	Yield in Bushels per Acre.					Average Yield for Five Years.
	1913.	1914.	1915.	1916.	1917.	
Yandilla King	28·8	3·5	15·6	12·2	11·8	16·4
Federation	27·9	4·0	20·5	14·4	10·8	15·5
Marshall's No. 3	26·7	1·8	18·6	16·8	11·8	15·1
Dart's Imperial	25·2	3·6	15·3	17·5	10·4	14·4
College Eclipse	27·0	4·0	18·6	11·3	7·7	13·7
Currawa	..	3·5	21·3	14·3	11·9	12·7
King's Early	22·1	6·0	20·0	7·5	7·4	12·6
Penny	..	..	22·3	16·7	10·7	Not grown sufficiently long
Major	..	..	..	18·7	13·3	,,



Variety Plots. These are sown with seed from the Selection Plots; they also furnish the seed for the Bulk Plots.

A glance at these results shows that at Werribee, Major, Currawa, Marshall's No. 3, Penny, and Yandilla King have each given better average results than Federation, which is generally looked upon as the standard variety. It should, however, be remembered that Major, Currawa, and Penny were not grown in 1913, when the general average of the yields was somewhat lower.

At Longerenong, selected Federation holds first place with the high average yield of 36.1 bushels per acre, which is 5.7 bushels better than Federation (not selected). It must not be overlooked, however, that Major, Currawa, and Penny, which have done so well at Werribee, have not been tried sufficiently long at Longerenong to test them fully.

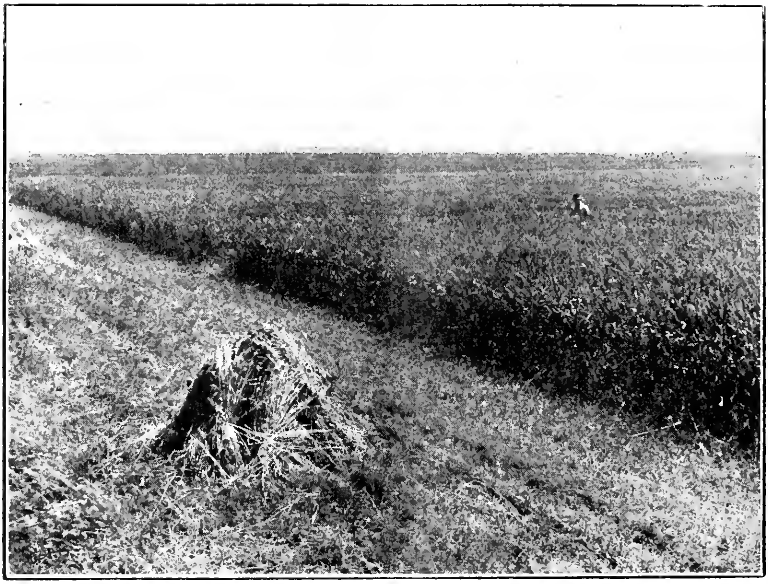
At Rutherglen, Yandilla King has done best, beating Federation, the next best, but only by an average of .9 bushels per acre. As at Longerenong neither Penny nor Major was grown before 1915.

It will be noted that all the plots are sown necessarily at the same time, without taking into account whether the time selected is more favorable to some varieties than others. This aspect is discussed below.

Results, Early and Late Sown Trials, 1917 18.

Longerenong.

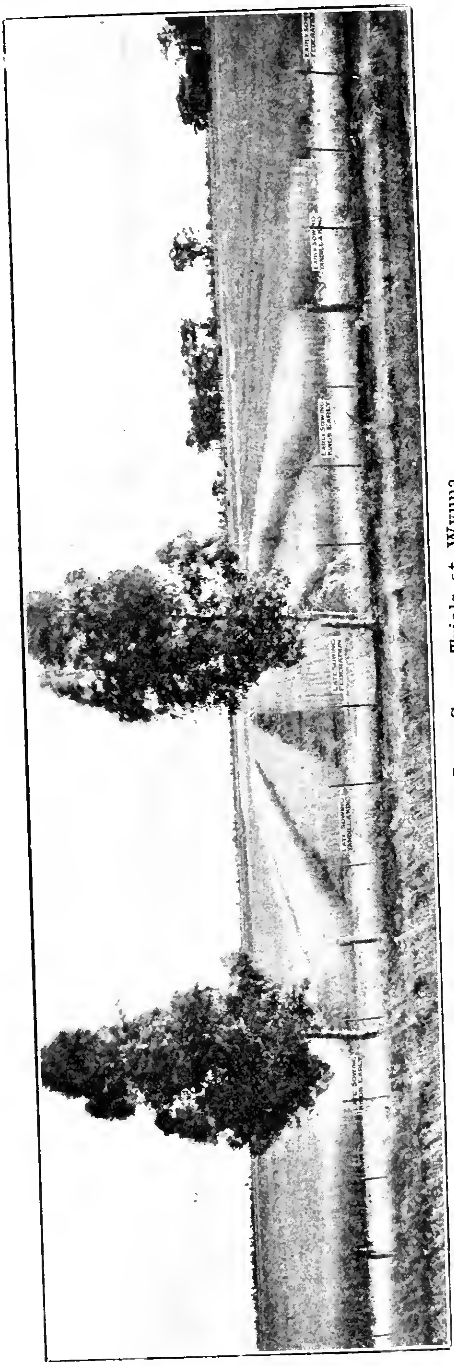
Variety.	Type.	Early Sowing—25th June.	Late Sowing—28th July.	Difference in favour of Early Sowing.	Difference in favour of Late Sowing.
		Bush. per acre.	Bush. per acre.	Bush. per acre.	Bush. per acre.
King's Early	Early	37·8	41·6	..	3·8
Bunyip ..	Early	39·3	38·4	·9	
Federation ..	Mid. season	43·9	48·2	..	4·3
Dart's Imperial	Mid. season	37·0	39·7	..	2·7
Marshall's No. 3	Late	38·4	38·4		
Yandilla King	Late	41·6	36·5	5·1	



Bulk Plots, from which the seed sold to farmers is obtained.

Wyuna.

Variety.	Type.	Early Sowing—Last Week in May.	Late Sowing—First Week in July.	Difference in favour of Early Sowing.	Difference in favour of Late Sowing.
		Bush. per acre.	Bush. per acre.	Bush. per acre.	Bush. per acre.
King's Early	Early	10·9	20·8	..	9·9
Federation ..	Mid. season	23·8	19·9	3·9	
Yandilla King	Late	34·9	21·7	13·2	



Early and Late Sown Trials at Wyuna.

Early and Late Sown Trials—Object of the Test.

Under practical farming conditions, the time to begin sowing cannot always be determined beforehand, as can be done in the case of the variety plots. There is generally too big an area to sow, consequently if the rains be delayed, or owing to other causes, the seeding season may be unduly protracted. When varieties which have an extended period of growth, and, therefore, possess greater foraging power and potential yielding capacity, are sown late, they are often liable to be prematurely ripened by hot winds or the early approach of summer; yields consequently suffer. In these circumstances, it is generally found that the quicker-maturing varieties give better results, as they are likely to be relatively more advanced than the late varieties. The object of these tests is, therefore, to determine the differential effect of various times of sowing on early, mid-season, and late varieties.

At Longerenong the early sown plots were drilled in on 25th June, and the late sowing was made on 28th July—about a month later. At Wyuna the early sown plots were drilled in the last week in May, and the late ones during the first week in July.

Results show that at both centres any marked differences are in favour of a late sowing of early varieties like King's Early, while in the case of late varieties, such as Yandilla

King, the position is reversed. At Wyuna the results were very noticeable; here the late sown King's Early yielded 9.9 bushels to the acre better than the same variety sown early, and with Yandilla King the difference due to early sowing was 13.2 bushels per acre.

It is evident, therefore, from these and similar results obtained in other years, that a judicious selection of early, mid-season, and late varieties is necessary to get the most profitable results on the average wheat farm.

THE IMPORTANCE OF BUTTER FAT IN HUMAN DIET.

(Reprinted from "The Dairy.")

Prof. E. V. McCollum, a well-known investigator in food values, has completed a course of experiments extending over ten years into the values of dairy products, and he has arrived at the conclusion that they should be used freely, regardless of cost. He declares that in human dietaries the safe plan is: Protect the dairy industry, no matter what effects may come to us, and how expensive it may become to produce dairy products. The dairy industry is the greatest safeguard to nutritive food. If we did away with the dairy industry we would soon become an inefficient people compared with what we are.

Recently, Prof. E. V. McCollum gave an address on the subject of his ten years' experiments at the University of Wisconsin, the title of the lecture being "What we should Eat during the War," and the following is a report of a portion of his remarks:—

"Ten years ago, when I took up the study of nutrition, the text-books, both on human nutrition and dietetics of the animal production, enumerated as the constituents of food: proteins, carbohydrates and fats, and inorganic salts. Now, it so happens that several people in Scandinavia, England, and some other European countries, who are physiologists, had already taken purified proteids and purified nitrates and combined these with purified fats. When analyzed, such a mixture of food shows it has proper protein contents, proper amounts of digestive nutrients, and yet, if an animal is fed on such stuff, all the time from birth until old age, the nutrition is a complete failure.

The first effort ever made in the investigation of nutrition problems was to find out why an animal does not thrive on these mixed or purified foodstuffs. To make a long story short, there are, in addition to proteins, carbohydrates and fats, and inorganic salts, two still unidentified substances that one must have in the diet. One of these—which I will call a water soluble unknown—is everywhere except in the purified foods which I have just mentioned. They are relatively poor in this substance—so are commercial starch and fats. Not a great deal is known about it, except that it is soluble. Therefore, I will refer to it as water soluble unknown. It can be taken from corn or any other seeds, from plants, also from milk. It seems to be everywhere except in this little list of foodstuffs. If the diet of an animal does not contain this water soluble unknown, provided the diet is made up of sugars, starch,

and fats, and nothing else is given to the animal, the animal will waste away and die in a couple of months.

Occurrence of Unknown.

There is, however, another substance which was not appreciated until 1913, and that substance is always present in certain animal fats. I first found it in butter-fat, but it is also present in the fat of eggs. It is also present in the kidneys and liver, but it is not present in vegetables. I want you to keep this second unknown substance in mind. The dietarian who lives on vegetables alone does not get it in his food. There is no shortage of it in nature, however, because while it is not in vegetables, it would be obtained in the fats of milk and certain fats of animal origin. There is an abundance of it in the leaves of plants. Now, with two exceptions, the seeds of plants, so far as I know anything about them, are short of this one thing.

Let me illustrate again the principle which I want you to keep in mind. We will make 15 lbs. of a carefully purified mixture of protein. We will take casein from milk, because it is easy to get and is an excellent example; the grain starch, the sugars (of whatever origin you want to get them); such fats as olive oil, lard, or whatever oil is readily available; and any mixture of inorganic salts that is suitable—we will put those together and feed the mixture to a young animal, and he will waste away and die in a comparatively short time. It contains carbohydrates and fats, and inorganic salts, but it is a total failure.

Now, let us put in as part of the vegetable fat, say, 5 per cent. of butter-fat, and feed it to an animal, and again he will die just as quickly as if you didn't give him any food. Take this mixture of purified foodstuffs, which contains a certain amount of butter-fats, and put it with seeds and plants (except rice, and starch, and crystalline sugars), and then add the leaf of corn or alfalfa; it is a complete ration, and the animal will thrive from infancy to old age. If you take 5 lbs. of purified foodstuffs and apply to it this water soluble unknown, and leave out the butter-fat, and leave in some vegetable fat, the animal is no better off than if you had not left it in; but put in both these, and then your feed becomes adequate, from infancy to old age.

Butter-Fat Needed.

We try another experiment with a pure protein, and we add a little butter-fat to supply this unknown content, with a suitable salt addition, and the animal will thrive from infancy to old age. It will have the normal number of young, and they will rear their young. Now, if you use neither of these and feed only oats and corn, he will die. If you feed him on corn, he will die after a little while. And what is true of one seed is, generally speaking, true of other seeds. Then if you mix the two grains together, you will, in a certain measure improve the mixture later. In other words, you have better protein if you mix two seeds, and still better, probably, when you mix three. Now, when you feed a mixture of oats, millet, and flaxseed, he will never grow one gram, I do not care what species he is. To make this a good feed, you only have to add two things. One of these is this water soluble, and the other is common table salt. Such a mixture of seeds never contained enough of that salt. You must put in a certain amount of lime content

of lime calcium, and you must add chlorine calcium and protein. Animals fed on foods that do not contain these ingredients never produce and rear young. They may in a few cases have a few young, but they will never rear any. There are just such situations arising in practically every community.

False Economy.

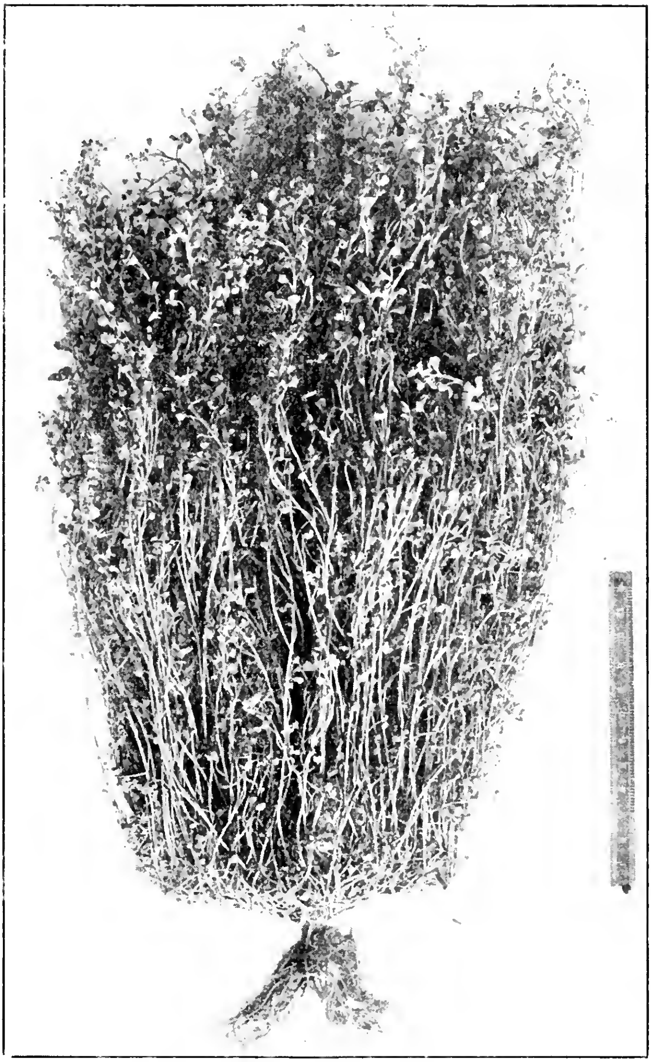
The price of foodstuffs has continually been rising during the last few years, and the point has already been reached when the housewife, who is dependent for the upkeep of the family expense account on the wages of even a skilled artisan, has difficulty to make the proper purchases of food. Now, under these circumstances, the natural tendency is for women to begin to restrict the number of purchases for the table to those articles which appear to be cheap. The text-books on dietetics even to-day are beginning to tell the story that I have just told you in the last few minutes. The main points that are emphasized in the discussion of human dietaries are the protein contents. The point I want to emphasize is this: the most expensive foods, and therefore the articles on which the first cut is liable to be made, are eggs and dairy products. These are the most expensive articles; they appeal to the housewife as being the most expensive foods.

Protect Dairying.

In human dietaries, the safe plan is this: protect the dairy industry, no matter what effects may come to us, and how expensive it may become to produce dairy products. The dairy industry is the greatest safeguard to nutritive food. If we do away with the dairy industry, we do away with the use of cream in our coffee and our desserts, and we would soon become an inefficient people compared with what we are. Just consider this world in a general proposition, and consider what people are thrifty, and consider the character of their diet. Which people are progressive? The greatest single event in the history of the progress of humanity is that time and event which led to the discovery of milk-producing animals. Unless a supply of milk was regularly available to a primitive people, some time in this history of this world, that people began forthwith to be outstripped by their neighbours in every undertaking which they might have attempted. Under no circumstances should the use of milk, and all the constituents of milk, be diminished.

The first place and the safest place to economize is in the consumption of meat. We can do without meat without any detriment if we care to give up our pleasure in eating meat. Now, meats are good. We all like them, and to some extent we are going to continue to eat meat. I would not advise doing away with the beef-producing industry, because a number of other industries are dependent upon the beef industry. The leather industry is one which we must protect. If we are to maintain an efficient dairy industry, we must produce a certain number of excess males among cattle. The beef animal largely takes care of itself. There is but a small labour item in the production of meat as compared with the production of milk. A number of reasons might be cited, but these are enough; but wherever it is necessary to economize, the wise thing to do is to shear the family budget in those

expenditures of meat, and use meat largely for conferring palatability on vegetables, and in the form of soups and gravies, and such things to which meat will add palatability which are not very acceptable as a human diet."



A Good Specimen of Subterranean Clover.

The above picture illustrates a specimen of subterranean clover (*trifolium subterraneum*) grown on the farm of Mr. Stirling Jones at Flinders.

In forwarding the specimen, Mr. Jones remarked, "Subterranean clovers grow in abundance in the volcanic soil near Flinders. I have never known a paddock to be sown down solely with this clover, yet there are hundreds of acres of it in the district—in fact, it is popularly believed to be a native plant. It usually grows in a great mat, and dies down about Christmas, but springs up quickly after the first autumn rains. Stock are very fond of this clover and keep it closely cropped, even though grasses in the same paddock may be a foot high."

The following extract from a report on Trials of Grasses and Clovers under Irrigation at the Yanco Experimental Farm is reprinted from the New South Wales *Journal of Agriculture* for February, 1917.

"*Trifolium subterraneum.*—This is one of our most promising clovers. It probably gets its name from the habit of growth, the lowermost shoots forcing their seed-pods into the soil in readiness for future propagation. It has made exceptionally good growth this winter, which is its second season. The stems, all of which are green and succulent and carry a fair amount of leaf, have grown over each other to a depth of five or six inches, completely filling the spaces in between the rows (2 ft. 6in. apart), and now forming a dense mat. The leaves are inclined to be a little hairy. Growth commences about March, and continues well into the spring; in fact, the bed is still, at date of writing (23rd November, 1916), quite green. Although not grazed here, in other parts it has been fed off continually, and found to be very useful. Its lower stems cling to the ground; it is thus protected from being killed out by stock. Owing to its seeding capabilities, which are important, and its being a succulent nitrogenous fodder, it is worthy of a place in any pasture, especially for winter and spring use."

BRACKEN A SOURCE OF POTASH.

There is no scarcity of bracken in Australia, and it is interesting to learn that this ubiquitous weed may be used as a source of a commodity that is as scarce as it is valuable. In a leaflet recently issued by the Board of Agriculture of Scotland, it is stated that the ash of bracken is exceptionally rich in potash salts. The utilization of the ash would serve two purposes: (*a*) as an additional source of potash, and (*b*) as a means towards the eradication of bracken. In the preparation of the ash certain points require to be borne in mind, and are dealt with under the following headings:—

Time of Cutting.

The best time to cut is when the largest yield of potash can be secured. This stage is reached when the plant is fully grown. Although the ash of the young plants is richer in potash the yield per acre is greater from the mature plants. When fully grown the fronds become tough and fibrous, and some of the pinnae or small leaves begin to change colour and wither. Repeated yearly cuttings for three years in succession will exhaust the roots and practically destroy the bracken. A hook or sickle is the most suitable weapon in the hands of boys for cutting, especially when the bracken is growing on the side of a hill. On more level ground a scythe can be used with advantage.

Drying and Harvesting.

Dry sunny weather is very necessary at the time of cutting, since over 90 per cent. of the total potash is soluble in water. While the bracken is still alive rain will not dissolve out the potash from the fronds, but if it is withered and dead, rain soaks into the tissues, and in course of time will dissolve out practically all the soluble salts. Turning the fronds hastens the drying. As soon as dry the fronds should be raked and collected into small heaps either for stacking or burning. In any case, the dry bracken must not be left exposed in rainy weather. Rough handling of the fronds will break off much of the small leaf, as when dry they become brittle, and will thus reduce the yield.

Stacking and Burning.

The dry bracken may be stacked and either used as litter, &c., or burnt for the ash. For carting and stacking fairly level ground is desirable. If the situation is a very inaccessible one, and in bad country, the dry bracken is best collected and burnt in a suitable place on the spot. The dry bracken burns easily. The burning should be conducted in as sheltered a place as possible to prevent the ashes from being blown away. The base of the fire should first be hollowed out. The fire should be stirred occasionally with a pole to assist the burning of the charred material, and as it burns down to an ash the fire should be replenished with more dry bracken until a good heap of greyish ash is eventually obtained. If the temperature gets too high the ash is liable to melt into solid lumps, a condition to be avoided.

Bagging of the Ash.

On no account must the ashes be left exposed to rain, which would dissolve out the soluble salts. When cold the ashes should be bagged and the bags covered with a tarpaulin. If this is not practicable, the ashes must be covered with corrugated sheet iron or a tarpaulin to protect them from the rain until they can be bagged. The bags must be stored in a dry place until the ashes are required.

Properties of the Ash.

When properly burnt the ash is bulky and generally greyish in colour, of a light friable and powdery nature, distinctly alkaline and a little caustic. The alkalinity is due mainly to alkaline carbonates and to a small extent to some free lime and magnesia. The potash is in combination mostly as the sulphate and the chlorides, and to a less extent as the carbonate.

Yield and Utilization as Manure.

The ashes should contain between thirty and forty per cent. of potash soluble in water. With the market value of potash at 12s. 6d. per unit, the price of the ash would be between £18 and £25 per ton. The yield of ash per acre will depend upon the density of growth and height of the fronds and upon the care bestowed on the harvesting and burning of the bracken and on the collection of the ash. When the growth is thick and vigorous it requires from 4 to 5 acres of fully-stocked bracken land to yield 1 ton of ash, compared with from 7 to 10 acres when the growth is sparse. The ash, because of its light dry character, is most suitable for mixing and applying along with other manures, except those containing ammonium salts, which would be decomposed, liberating free ammonia.—*The Queenslander,* 15th December, 1917.

METEOROLOGICAL OBSERVATIONS.

Research Farm, Werribee.

Summary of observations made during 1917, and comparison with previous years:—

Rainfall.

Average rainfall for forty-two years prior to 1913	=	20·19 inches
Rainfall during 1913 (505 points in March)	=	16·43 ,,
Rainfall during 1914 (304 points in December)	=	13·24 ,,
Rainfall during 1915	=	15·55 ,,
Rainfall during 1916 (4·46 inches in January and February, and 17·71 inches in September, October, November, and December)	=	28·79 ,,
Rainfall during 1917 (9·29 inches in September, October, November, and December)	=	20·10 ,,

Evaporation.

Evaporation from free water surface, 1913	=	46·438 inches
,, ,, ,, ,, 1914	=	50·548 ,,
,, ,, ,, ,, 1915	=	51·754 ,,
,, ,, ,, ,, 1916	=	43·160 ,,
,, ,, ,, ,, 1917	=	46·875 ,,

Bright Sunlight.

Total bright sunlight during 1914	=	1,906·5 hours	=	Daily Mean, 5·2 hours.
,, ,, ,, 1915	=	1,865·9 ,,	=	,, 5·1 ,,
,, ,, ,, 1916	=	1,841·8 ,,	=	,, 5·0 ,,
,, ,, ,, 1917	=	1,729·9 ,,	=	,, 4·7 ,,

Mean Air Temperatures.

Year.	Dry Bulb.	Wet Bulb.	Maximum.	Minimum.	Mean of Max. and Min.
1914	59·4° F.	55·8° F.	69·6° F.	48·6° F.	59·1° F.
1915	57·9° F.	53·8° F.	67·4° F.	47·8° F.	57·6° F.
1916	57·2° F.	53·4° F.	66·1° F.	47·7° F.	56·9° F.
1917	57·5° F.	53·7° F.	66·2° F.	48·2° F.	57·2° F.

Mean Soil Temperatures.

Year.	At 1 Inch.		At 6 Inches.		At 12 Inches.		At 24 Inches.	
	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.	Maximum.	Minimum.
1914 ..	70·9° F.	50·6° F.	63·6° F.	52·6° F.	61·6° F.	56·8° F.	60·2° F.	58·6° F.
1915 ..	72·1° F.	50·8° F.	63·2° F.	51·5° F.	60·8° F.	55·5° F.	59·9° F.	57·2° F.
1916 ..	70·2° F.	50·9° F.	61·4° F.	54·1° F.	59·2° F.	54·2° F.	58·5° F.	56·2° F.
1917 ..	68·3° F.	52·4° F.	61·6° F.	55·4° F.	59·5° F.	54·6° F.	58·6° F.	56·9° F.

Mean of Maximum and Minimum Soil Temperatures.

Year.	At 1 Inch.	At 6 Inches.	At 12 Inches.	At 24 Inches.
1914	60·7° F.	58·1° F.	59·2° F.	59·4° F.
1915	61·4° F.	57·3° F.	58·1° F.	58·5° F.
1916	60·5° F.	57·7° F.	56·7° F.	57·3° F.
1917	60·4° F.	58·5° F.	57·1° F.	57·8° F.

A FORM FOR DESCRIBING MAIZE EARS.

For the purpose of keeping a record of the types of maize ears which are used in the ear-row system of maize improvement, and also for a detailed description of ears of different varieties as a record of the standard type, the following form has been found, after trial over a number of years, to answer the purpose best:—

Variety ....
Registered number ....
Pedigree number ....
Obtained from ....
Weight of ear (to $\frac{1}{8}$ oz.) ....
Shape—Cylindrical, slightly tapering, or tapering..............
Length (to $\frac{1}{4}$ in.) ....; circumference (to $\frac{1}{4}$ in.) ....
Indentation—Smooth, crinkled, creased, or pinched..............
Shallow, medium, or deep......................
Beaked or unbeaked.........................
Rows—Number........; paired or unpaired..................
Straight, curved (to right or left).....................
Tip—Well filled, medium, or poorly filled......................
Regular or irregular.................................
Husk protection—Good, medium, or poor.....................
Butt—Well-rounded, medium, or flattened......................
Regular or irregular.................................
Shank—Large, medium, or small; diameter (to $\frac{1}{8}$ in.) ....
Round or oval-shaped..............................
Space between rows—Wide, medium, or narrow...............
Deep, medium, or shallow................
Grains—Firm, medium, or loose on cob.......................
Grain—Thick, medium, or thin.............................
Average breadth of grain (to 1-16th in.) ....
Weight of core (to $\frac{1}{8}$ oz.) ....
Colour of core—Dark red, red, light red, white.................
Size of core—Large, medium, or small......................
Circumference (to $\frac{1}{4}$ in.) ....
Weight of shelled grain (to $\frac{1}{8}$ oz.) ....
Percentage of shelled grain....................................
Average length of grain (to 1-16th in.) ....
Colour of grain—Dark red, medium red, light red, amber, yellow, white ....
Brightness of grain—Bright, medium, or dull.................
Grain—Horny, medium, or starchy..........................
Size of germ—Large, medium, or small.......................
Shape of grain—Rounded, square, oblong, wedge-shaped, shoe-peg, or pointed...............................
Number of grains per oz.......................................
Other remarks..

This form is used in describing all the ears selected for the ear-row tests at the various Experiment Farms of the State where maize improvement is being carried out by this system, and it is expected that there will

be found certain ear characters which are in some way related to yield for a definite variety when grown in a particular climate on a certain class of soil. It is well known that a variety of maize in acclimatizing itself to a given district, or adapting itself to a certain soil, tends to change to a definite type of improved yielding capacity; and it is hoped that the records of a few years, obtained from the descriptions of the ears used in these tests, will be useful in establishing some correlations between these ear characters and yield. Already some of these characters give promise of being associated with yield, while others have apparently no relation to it; but it will be necessary to have the results of several years before any definite conclusions can be drawn.

A few explanatory notes may be found useful to those who wish to use this form, and it is recommended for the use of teachers of agriculture in country schools who are desirous of instructing the boys in nature study with maize.

The *registered number* is useful for the purpose of keeping the ears catalogued for comparison; and the pedigree number is the registered number of the mother ear of the preceding year, which it is possible to obtain if the ear-row system of planting is adopted.

The *weight of the ear* before shelling may be obtained to the nearest $\frac{1}{8}$ oz. on an ordinary spring letter-balance. The *circumference* of the ear is to be measured at one-third of the distance from the butt of the ear.

Smooth indentation means complete absence of crinkling or creasing of the dent. A *crinkled dent* is one which has slightly raised folds of hull or skin running across the indentation. A *creased dent* has the edges of the indentation somewhat rough and inclined to be drawn together, giving the crown of the grain a rough feeling.

A *pinched dent* has the opposite edges of the dent drawn together, and is very rough to the feel. The *dent is beaked* when the upper edge is drawn out longer than the other.

The rows are *paired* when a larger furrow occurs between the double rows of grain on the ear.

A *regular tip* has the grain running in straight rows right up to the tip.

The *husk protection* is good or poor according to the absence of presence of weather discoloration or insect injury.

The *rounding of the butt* is indicated by the depth of the depression in the butt of the ear, and the filling of grain around this depression where the shank has been attached.

The *shank* is said to be *large* when the diameter of its "scar" of attachment to the cob is $\frac{7}{8}$ inch, or over; *medium*, when about $\frac{3}{4}$ inch; and *small*, when $\frac{5}{8}$ inch, or less.

The *grain* is *thick* when ten grains on the ear measure $1\frac{3}{4}$ inches, or more; *medium*, from $1\frac{1}{2}$ to $1\frac{3}{4}$ inches; and *thin*, less than $1\frac{1}{2}$ inches.

The *breadth* of the grain is best taken on the cob before shelling. It is the greatest breadth of the grain about one-third of the distance from the butt of the ear. It should be taken to the nearest 1-16th inch.

The *weight of the core* is taken to the nearest ⅛ oz. by the letter-balance. The weight of shelled grain is determined by the difference between the weight of the core and the initial weight of the ear.

In measuring the average length of grain, neither the tip, cap, nor rough-beaked projections on the crown of the grain are included.

The terms used in describing shape of grain are self-explanatory, except, perhaps, that of *shoe-peg,* by which is meant long, very narrow grain.

The number of grains per ounce is determined by weighing out this quantity of the grain on a spring letter-balance.—Reprinted from *Agricultural Gazette* of New South Wales.

THE ROMANCE OF THE PLOUGH.

"The Romance of the Plough" may seem far-fetched in the present circumstances, perhaps, and yet the story of the gradual development of this most useful implement from times of long ago is full of interest. The process by which it has gradually been evolved from a rude beginning to the present stage is an interesting story, given in a bulletin issued by the Department of Agriculture, Canada. The first plough was a pig's nose, the job being done by pigs, as they rooted over the soft earth in search of juicy plant roots or fat grubs. The farmer of long ago noticed the efficient manner in which the pigs turned over the soil, and tried to imitate them. He cut down a small tree and trimmed off all but one branch, leaving this one about 2 feet long and sharpened on the end. A long stick was fastened to the trunk of the tree with which to steady it, and the plough was ready to use. This was dragged up and down over the area to be planted, and the earth torn up until it was sufficiently loosened to give a covering of soil for the seed to be sown. The only reason given for ploughing the soil in those days was to get a covering of earth for the seeds. It was soon found, however, that the weeds got thicker and thicker after each crop, and as years went by and the field was ploughed up again and again, the soil became harder to work. It would be very sticky when wet, and bake into a hard mass when dry, and the plants were greatly injured by the dry weather. Now the reason of this was that the stick plough did not turn the weeds and weed seeds under the soil to smother and die, neither did it turn up their roots to be killed by the frosts. Neither did the plough crumble the soil as do the ploughs we now use; nor did this stick-plough loosen the soil to any great depth, for, had the soil been worked deeper, it would have held more of the rains, and the plants would not have died of thirst in the hot season. But even if these farmers of long ago had a poor plough, they at least had grasped the idea suggested by the pig's nose, and many improvements were soon made in the shape of the plough

which increased its usefulness. But for many years the plough remained at best a clumsy implement, which served to stir the soil to only a very slight depth, and did not cover the weeds and grass as a good plough should do. A peculiar custom in some countries was to draw ploughs by tying them to the tails of horses or oxen. They had no harness-makers such as we have, and leather harness was unknown. So tying a plough to the horse's tail was about as handy and cheap a way of "hitching up" the horse or ox as could be thought of. After a while people began to see that this was a cruel practice, and laws were passed making it a crime to plough in this manner. The plough of those days left the soil lumpy, and the farmer or his sons broke up the clods with a club, one of the reasons for ploughing being to make the soil fine and granular. A lumpy soil will not germinate seeds well, for, to make seeds come up quickly, the soil should be fine enough to touch the seed on all sides. A lumpy soil will not grow large and healthy plants, for the roots find it difficult to obtain food and water. All the ploughs mentioned above were made of wood; but they used to break easily, and would wear out quickly; so some one made one partly of iron, placing the iron on the parts of the plough that used to wear out first; the other parts were still made of wood. Later the ploughs were made of iron, except the handles. Strange to say, as a new and useful idea is oftentimes ridiculed, so it was with the iron plough. Some farmers said it made the weeds grow, others that it poisoned the soil, and many refused to use it. However, this strange opinion soon died out, and the wooden ploughs can now be found only in the museums.—*The Octago Witness.*

GUNFIRE AND RAINFALL.

There used to exist, and it exists even to the present day, a popular belief that the explosion of guns induces rainfall, and special guns were constructed with the object of bringing down falls of rain during dry seasons. Several experiments to test this theory were made some years ago in Queensland by means of kites and guns, but all resulted in failure.

In an article in the London *Times* of 21st December, 1914, we find the following notes on the subject:—

"An impression has arisen in some quarters that the heavy and persistent rains recently experienced in this country (Great Britain) are attributable to abnormal atmospheric disturbances produced by heavy gun-firing at the seat of war. The idea is by no means novel, and, like other meteorological myths (such, for instance, as the belief in thunderbolts and the supposed influence of the moon upon our weather), it seems to possess a bullet-proof hide and takes any amount of killing.

About four years ago the First Lord of the Admiralty was asked in the House of Commons whether he would instruct the Fleet to carry out their heavy gun practice at some period of the year other than in the middle of harvest time, 'when the resultant heavy rain may cause serious loss to the farming community.' A similar suggestion was made at the instance of a member of the Highland and Agricultural Society of Scotland who, at a meeting of that body, moved that 'the Admiralty be petitioned to discontinue heavy gun-fire round the coasts in August and September, when clouds were about' (*sic*), the speaker adding that 'firing was apt to bring down rain, and at that time of the year fine weather was desirable.' It may be said at once that the idea is absolutely without foundation. Experiments made some years ago in America and on the Continent showed that in droughty weather no amount of concussion in the air artificially produced had the slightest effect in the production of rain.

"At the present time there is one fact which should (one scarcely likes to believe that it will) at once dispose of the cherished theory. In spite of occasional displays of unwonted activity, there are no reasons for thinking that gun-firing at the front is more violent than it was in the earlier stages of the war. The spell of unsettled weather should therefore, have commenced shortly after the outbreak of hostilities. As a matter of fact, nothing of the kind took place. In August and September the rainfall in the south-east of England was, on the contrary, much below the average, and in October there was again a considerable though less marked deficiency.

"As an instance of the unreliability of the notion respecting the effect of detonation upon rainfall, a correspondent of *Symon's Meteorological Magazine* drew attention some little time ago to the fact that at Shoeburyness, where at certain seasons of the year big guns are being fired almost daily, the average annual rainfall is smaller than in any other part of the United Kingdom."

—Queensland *Agricultural Journal*, February, 1918.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Pomologist.

The Orchard.

Green Manures.

If a cover crop of leguminous plants is required for green manuring a start at planting may now be made. This can be done only when all the fruit has been gathered from the trees. An early crop is a distinct advantage. The cover crop should make a good growth before the winter sets in, as the plants make very little headway in the cold weather,

and they require to be ploughed in as soon as the ground is dry enough in early spring. It will thus be seen that it is necessary to get a good autumn growth, as dense as possible, and one which will adequately cover the surface before winter.

CULTIVATION.

Should the weather become hot and dry it will be very necessary to give the land surface a good stirring, so as to conserve water supplies. Where fruit crops have been gathered a start may be made late in the month with the autumn ploughing; whatever ploughing is done should be left as rough as possible.

PESTS.

No codlin moth-affected or diseased fruit of any kind should be left on the ground after the crop has been gathered. These should all be destroyed by boiling.

All rust-affected foliage and fruit of plum and peach trees, as well as all other stone fruits that have been attacked by this and other fungus diseases, such as shot-hole, &c., should be burned if possible. This will minimize the possibility of future attacks.

Vegetable Garden.

Autumn weeds must be kept out of the kitchen garden. These rapidly grow, and remain as robbers right through until the spring time.

The section should be well dug over for planting winter crops. Before digging a light sprinkling of bonedust and a good top dressing of stable manure should be spread on the surface. These may then be dug in, as they provide humus for the soil. Large plots should be avoided in winter; where such occur a path should be run down the centre. This will provide more efficient drainage. The beds, too, may be more raised than in the summer time.

Early onions may be planted out in the beds, and, if not already done, onion seed should be planted at once.

All classes of seedlings may be planted out, and seeds of lettuce, early peas, beet, carrots, radish, cabbage, cauliflower, and swede turnip may be sown.

Asparagus beds should be cleaned up and cut down as soon as the berries begin to colour. Celery rows should be kept earthed up; rhubarb beds should be given a dressing of manure to encourage the coming winter crop, and new rhubarb plantations may now be established.

Flower Garden.

All classes of spring-flowering bulbs may now be planted. In bulb planting the bulbs should not come in contact with any manure. The

manure should, some time previously, have been dug well in, and mixed with the soil, and all heat should have disappeared. If manure is required it should be placed below the bulb, so that the roots may ultimately penetrate to it. Bulbs thrive in sandy soils, and where the soil is heavy a little sand may be added to advantage. Bulbs should not be planted too deeply; the depth to plant is generally regulated by the size of the bulb. Such bulbs as freesias may be covered with only an inch of soil, while larger bulbs may be somewhat deeper.

Dahlias and chrysanthemums may be fed with liquid manure, or mulched with stable or poultry manure. In any case the feeding should not be too strong nor too frequent, and it should always be withheld before the flowers come.

All hardy annual, biennial, and perennial seeds may now be planted. Among these are dianthus, candytuft, sweet peas, Iceland poppies, anemone, ranunculus, stock, wallflower, columbine, foxglove. phlox, penstemon, pansy, gaillardia, &c.

Wherever aphis and red spider occur the plants should be sprayed with benzole emulsion, nicotine, pestend, or soaperine, or some other preventive in order to protect the coming flowers. Mildew attacks on the rose should be warded off by the use of sulphur. The sulphur may be either dusted on the plant or it may be scattered on the ground around and under the plant.

March is one of the best months for transplanting evergreen plants of all classes, trees, shrubs, and palms. The roots of the transplanted plants should be disturbed as little as possible, while the roots of those transplanted from pots should be well uncoiled and set out before planting.

The soil is now warm, and the roots will quickly take hold and grow. They are thus established for the winter, and will give little or no trouble in the subsequent summer heat and dryness.

In preparing the soil for planting the trees care should be taken not to dig small holes. A small hole is simply a "pot hole," in which the winter water accumulates, and as a result the young tree roots are rotted.

A large hole should be dug; or better still, the whole planting area should be well cultivated all over, and the plants or trees then set out in this cultivated area.

The Eradication of Weeds.

With many, weeds are the chief factor in constant surface cultivation, and—much as the gardener otherwise regards them—they therefore have some utility in imposing an operation that in other respects has so much value as we have indicated above. The seeds of weeds are constantly being carted on to the garden with manure, and there are also seeds that are being deposited by wind, birds, &c., so that their destruction must ever be before the grower. The old saying that "one year's seeding makes seven years' weeding" is particularly true in a vegetable garden.

Seeds which are shed in one year, do not always germinate the following season—some may be buried too deep, or where the conditions are otherwise unfavorable, but they retain their vitality for a long while, and will germinate so soon as they are brought near the surface again, or when the conditions become favorable. For this reason it is always well tô prepare land for a crop early enough to allow a short fallow before the seed is sown or the seedlings planted out; the weed seeds brought into favorable surroundings then have time to germinate, and can be killed off by shallow, surface cultivation before the growth of the vegetables makes the destruction of the weeds more difficult. The practice will be found to materially reduce labour during the early growth of the crop.

Some crops, such as carrots, parsnips, &c., require a good deal of hand-weeding, but in most cases the cultivation between the rows can be done with a hand cultivator, which is much quicker than hand-hoeing. For other crops, which have more space between the plants in the rows, the weeding can be done by using small-pointed hoes. Weeding between plants should be done before the cultivation between the rows, so that the latter operation may loosen the soil that has been compacted by the tramping to and fro, though where weeds have become numerous the amount of hand-work can be considerably reduced by running the cultivator or hoe along between the rows before hand-weeding between the plants themselves is attempted; in the last case it will often be advisable to disturb the surface between the rows a second time after the hand-weeding is done. The best results from weeding are obtained by doing the work on hot sunny days. Most weeds are killed by cutting them off just under the surface of the soil, but to thoroughly eradicate some—couch grass and sorrel, for instance—it is necessary to remove every underground particle, or to cultivate persistently and repeatedly until the roots die of exhaustion. Nut-grass can only be controlled by frequent cultivation.

Where irrigation is practised the drains and channels should be kept free from weeds, otherwise the seeds will fall into the water and be distributed over the whole area irrigated.

The greatest trouble from weed-growth is experienced on the coastal areas of the State, where the conditions are conducive to rapid growth—conditions, by the way, that are also most favorable for early crops and for the service of the metropolitan market.

REMINDERS FOR APRIL.

LIVE STOCK.

HORSES.—Those stabled should be fed liberally. Food of a more stimulating nature can now be given to get them well over the "changing coat" season. Those doing fast or heavy work should be clipped; if not wholly, then trace high. The legs should not be clipped. Those not rugged on coming into the stable at night sweating freely should be wiped down and in half-an-hour's time rugged or covered with bags until the coat is dry. Yearling colts if vigorous and well grown may be castrated. Weaned foals should have a little crushed oats daily, if available. Horses to be turned out during winter should not be clipped. Their mouths and feet should be examined and attended to where necessary.

SHEEP.—Merino and fine cross ewes, if they have been mated early, will lamb from now on. Those in lamb to the larger British breeds of rams will give a certain amount of trouble in lambing.

Close attention should be given morning and evening to save every lamb possible, and any ewes that may be cast. If the ewes are well-woolled sorts, they will need crutching for fly, at the same time clear wool from around teats, and away from the eyes also. If the ewes are attentive mothers any lambs that are found dead after these precautions, apart from weather conditions, foxes, &c., are just as well gone. Give purgative drenches at first sight of ewes appearing ill in any way. Give warm salad oil to any lambs that are dull in appearance. Ewes after difficult parturition or retention of after-birth can often be saved by flushing out with ½ oz. Lysol to 3 pints warm water. Reserve fresh pasture, or better still, sow a mixed green crop to turn ewes into later on, but not while carrying the lambs, this is too often injurious. On fine mornings when attending ewes, if feed is plentiful and ewes strong castrate as many ram lambs as possible, they are easily caught when two or three days old. Place them between the feet on the ground, no holder is necessary. In districts where conditions make second dipping a necessity, see that it is done before the weather becomes too unsettled.

CATTLE.—As the nights become colder the dairy cows should be rugged. The rugs should be removed in day-time when the shade temperature reaches 60 degrees. If new grass is plentiful, give a ration of hay or straw, whole or chaffed, to counteract the purging effects of young grass. It will be found profitable to give a few pounds of bran, crushed oats or pollymeal in addition to other feed, to all cows giving a fair quantity of milk. Read article by Mr. B. A. Barr, "Food Values and Rations," in *Journal* for September, 1916. Algerian oats should be sown on suitable land for grazing off in the winter. Sow a mixture of oats, rye, and tares or peas for winter fodder or to fill silos. Only exceptional cows or those required for city milk supply should be served between now and July. Within the next two or three months is the best time for cows to calve, as they will pay to feed through the winter, give the best returns for the season, and be dry when the feed is dry and at its worst. Calves should have lucerne hay or crushed oats when grass is not plentifful.

PIGS.—Sows not already served should be put to the boar. Supply all pigs with plenty of bedding, and see that sties are warm and well ventilated. Supply sows liberally with grain. Castrate young boars as early as possible. Pigs should be highly profitable now, as feed is cheap, and pork very dear. Rape, barley (especially skinless), oats, &c., may be sown for grazing during winter.

POULTRY.—Do not feed maize this month—soft food aids moult; add a teaspoonful of linseed to each bird's ration once daily. The more exercise the hens get the better they moult. Remove all male birds from pens. Add to drinking water one packet Epsom salts to twenty birds. Keep a sharp look out for chicken pox. Forward pullets should now be in their winter quarters, with plenty of scratching litter, and fed liberally—including ration of animal food. Grit shell and charcoal should always be available.

CULTIVATION.

Farm.—Dig potatoes as they mature. Cart out and spread stable manure. Finish preparation of land for main cereal crops. Sow Chou Moellier seed in beds for transplanting. Sow the following mixture per acre for green feed during the winter months for the dairy herd:—$1\frac{1}{2}$ bushels, Oats; $\frac{1}{2}$ bushel, Cape Barley; $\frac{1}{2}$ bushel, Tick Beans; $\frac{1}{2}$ bushel, Pease. Sow Giant Drumhead Cabbage for transplanting (1 lb. sufficient for 1 acre, in rows 3 feet apart); provided the soil is in good friable condition, plants from seed sown last month should be planted out. Sow wheat and oats according to locality; also rape for winter feed or green manuring. Prepare clean seed-bed for lucerne; and sow Hunter River, Arabian, or Peruvian seed, free from dodder, in drills 7 inches apart and at the rate of 12-16 lbs. of seed per acre. Sow permanent pastures with grasses and clovers.

Orchard.—Prepare land for planting; plough deeply and sub-soil. Plant legumes for green manure. Plant out strawberries. Clean up Codlin Moth from trees as soon as all fruit is gathered.

Flower Garden.—Plant out evergreen shrubs, trees, and Australian plants, divisions of herbaceous plants, seedlings, layers, and rooted cuttings. Feed chrysanthemums with liquid manure weekly until flowers begin to open. Prepare land for future plantings of roses and shrubs.

Vegetable Garden.—Plant out seedlings from the seed beds. Dig all vacant spaces roughly. Sow onions for early crop; also peas and broad beans. Clean out asparagus beds wherever the seeds are ripening.

Vineyard.—Examine "Yema" grafts to see if strings require cutting. Consideration must be given to manuring; early application is strongly urged. Peas, &c., for green manuring should be sown as soon as possible.

Cellars.—Cleanliness is emphatically urged. Carefully remove all fermentable refuse—skins, lees, skimmings, &c. Such odds and ends favour multiplication of Vinegar Flies (*Drosophila funebris*). If present destroy these with formalin or insecticide powders. A little bisulphite or sulphurous acid in washing water is recommended; also free use of lime on floors, &c.

Government Herd of Red Polls

MILK RECORDS

The figures below refer to the cow's best lactation period. Details of each cow's yearly performance since the establishment of the herd are given in the Journal for February, 1917.

Each cow's averages for all lactation periods will be furnished on application to the Director of Agriculture.

COWS

NAMES.	Days in Milk.	Weeks in Milk.	Milk, in lbs.	Average Test.	Butter Fat (lbs.)	Commercial Butter (lbs.)	Price of Bull Calf.
Muria	365	52	14,972	5·9	885	1,008	43 Guineas
Birdseye ..	365	52	9,146	6·5	597	683	29 ,,
Netherlana ..	365	52	11,506	4·3	490	560	24 ,,
Vuelta	289	41¼	7,750	6·2	485	553	24 ,,
Persica	351	50	9,607	4·9	480	547	23 ,,
Cuba	337	48	10,464	4·5	478	545	23 ,,
Bullion	321	45¾	10,928	4·3	469	535	23 ,,
Virginia.. ..	344	49	10,252	4·4	457	520	22 ,,
Pennsylvania ..	348	49½	10,607	4·1	437	499	21 ,,
Sumatra ..	290	41½	9,232	4·6	431	492	21 ,,
Violet III. ..	365	52	9,172	4·7	427	488	21 ,,
Egypta	327	46¾	10,646	3·9	418	477	20 ,,
Phillipina ..	365	52	8,213	4·9	400	456	19 ,,
Mexicana ..	282	40¼	8,641	4·6	400	456	19 ,,
Lily	365	52	8,525	4·6	392	448	19 ,,
India	365	52	8,556	4·6	391	445	19 ,,
Europa	347	49½	8,765	4·4	387	441	19 ,,
Kentucky ..	338	48	9,893	3·9	382	435	19 ,,
Goldleaf ..	362	51½	8,415	4·4	378	431	18 ,,
Picotee	365	52	8,490	4·4	371	424	18 ,,
Primrose League (imp.)	365	52	8,060	4·4	353	403	35 ,,
La Reina ..	329	47	6,712	5·13	344	394	17 ,,
Pipio	334	47½	6,802	4·8	326	372	16 ,,
Mongolia ..	283	40	7,483	4·33	323	369	16 ,,
Turka	279	39¾	6,395	4·9	316	360	15 ,,
Britannia ..	329	47	7,637	3·9	301	343	15 ,,
Samorna ..	365	52	6,198	4·75	294	335	14 ,,
Asiana	279	39¾	5,933	4·9	292	333	14 ,,
Tennessee ..	311	44¼	6,706	4·2	283	322	14 ,,
Alpina	344	49	7,094	4·0	283	322	14 ,,
Sylvia	301	43	5,286	4·84	256	292	12 ,,
Hispana ..	365	52	6,574	3·6	242	276	12 ,,
Africana ..	303	43	5,082	4·72	240	274	12 ,,
Tasmania ..	325	46	5,112	4·52	231	264	11 ,,
Canada	275	39	4,918	4·07	200	228	10 ,,

HEIFERS (1st Milking completed, 1915-16)

NAMES.	Days in Milk.	Weeks in Milk.	Milk, in lbs.	Average Test.	Butter Fat (lbs.)	Commercial Butter (lbs.)	Price of Bull Calf.
Carribea ..	365	52	7,142	4·35	310	354	15 Guineas
Japana	357	51	7,788	3·63	283	322	14 ,,
Serbia	365	52	6,092	4·45	271	309	13 ,,
Itala	365	52	6,346	4·09	260	297	13 ,,
Oceana	365	52	6,247	4·11	256	292	12 ,,
Russia	365	52	6,413	3·96	254	290	12 ,,
Panama ..	288	41	5,997	4·23	254	290	12 ,,
Ontario ..	365	52	6,059	4·15	251	286	12 ,,
Soudana ..	346	49	5,486	4·54	249	284	12 ,,
Pacifica ..	365	52	4,979	4·88	243	278	12 ,,
Laurel	325	46	5,554	4·86	226	257	11 ,,
Barbery ..	359	51	5,387	3·72	200	228	10 ,,
Congo	296	42	4,449	4·21	187	213	10 ,,

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THE ADVANTAGES OF HERD TESTING.

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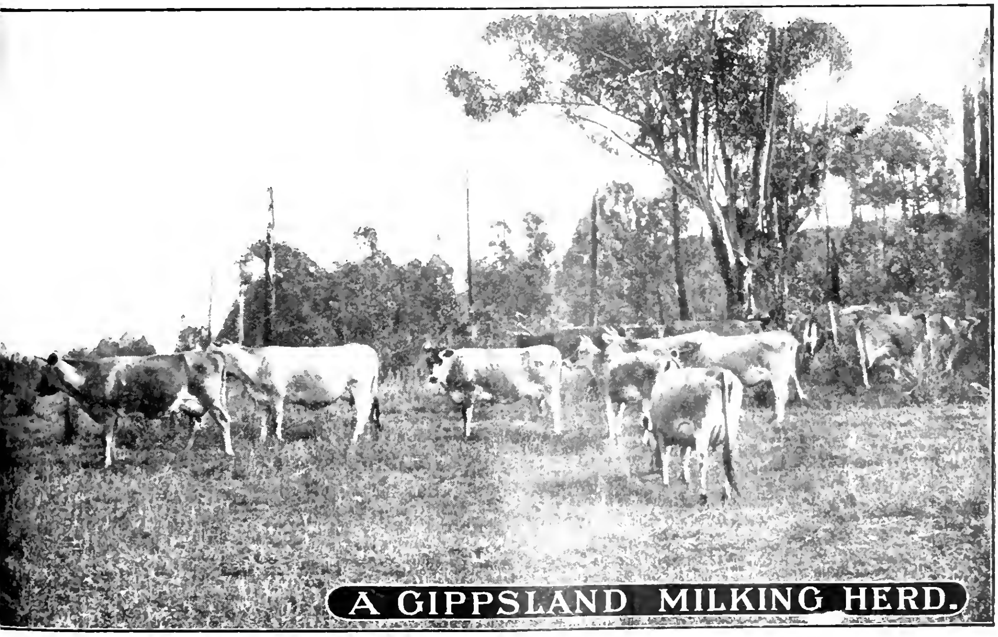
April, 1918.



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THE JOURNAL

OF

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VICTORIA, AUSTRALIA.

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THE JOURNAL

OF

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OF

VICTORIA.

Vol. XVI. Part 4. 10th April, 1918.

THE ADVANTAGES OF HERD-TESTING.

By J. S. McFadzean, Senior Dairy Supervisor.

It would be rash for any one to prophesy the length of time required to bring about definite changes in agricultural method, even where the alterations must assuredly result in a profitable monetary return. The conservativeness of our farmers has frequently been illustrated in different branches of farm practice, wherein the Department of Agriculture has advocated alteration or improvement of method in order to bring about increased production. Too frequently the result has been that, although even a small trial of an innovation demonstrated the wisdom of the Departmental recommendation, the farming community generally has proved very slow to listen to the advice offered.

The testing and certification of pure-bred dairy cows is one of these Government departures which at first made little headway, but which is being more widely recognised every year as highly profitable work to all dairy-farmers having the foresight to take advantage of it.

It was in November, 1910, that an article was published in this *Journal* pointing out that by failing to keep records of the milk and butter-fat yields of their cows, breeders of high-class dairy stock were neglectful of a profitable part in their business. The point overlooked was the fact that buyers of young bulls for the improvement of ordinary dairy herds were calling for such dairy records as a guide in making their purchases. Within six months of the publication of the article, the matter had been given thorough consideration by several members of the Royal Agricultural Society, with the result that the Department of Agriculture was asked to arrange and carry out a scheme whereby authenticated milking records of pure-bred cows could be obtained. Such a scheme was drawn up, approved by the Minister of Agriculture, and published for the information of pure stock-breeders. The first test was

3975.

conducted during 1912-13, and the fifth annual report on Pedigree Herd-testing was placed on record by the Chief Veterinary Officer in this *Journal* in September last.

During the past year twenty-four breeders of pure dairy stock submitted their herds to this Government testing, and there is every indication that this number will rapidly be added to. Buyers looking for complete milking records in the pedigrees of pure-bred dairy stock can now be supplied, and consequently Government-tested cattle have a much enhanced value as breeding stock. Young bulls bred from cattle hall-marked by having Government herd-testing records in their pedigrees are in high demand, and there is no doubt that the work done by the Chief Veterinary Officer and his staff in carrying out this scheme must be a strong factor towards increasing the future production of dairy produce in this State, both in total bulk and individual cow returns. Even those breeders who so far have not brought their herds under this Government test are very much alive to what is being done, and the testing of pure-bred stud dairy cows by their owners may be said to be now almost universally practised in this State, and with at least some desire for thoroughness.

Even under the Departmental system the owner of each herd is actually responsible for the regular daily weighing of the milk yield of each of the cows tested. This, however, is checked by officers of the Department also taking the weights at irregular intervals, and when taking samples of each cow's milk for the monthly butter-fat test. Thus the Department is able to vouch for the accuracy of the work done by the owners, and the annual publication in this *Journal* of the names and performances of all certificated cows and heifers places the detailed information of the tests at the service of all who are interested in it.

These records are of special value in making dairy-farmers acquainted with the milking capabilities of the several breeds of pure stock. In the Government test no cow over four years old is granted a certificate unless she has produced 250 lbs. of butter fat in the nine months' milking term. On a 4 per cent. butter-fat basis this is equal to 625 gallons of milk, or a daily average of 2¼ gallons for the whole nine months. This 9 quarts a day average for nine consecutive months is not an extraordinarily high standard, yet how many herds other than those owned by breeders of pure stock have cows giving this quantity?

Last year's records show that 146 stud cows over four years old, 25 cows on their second calf, and 42 heifers on their first calf all exceeded this 250 lbs. butter-fat standard. The whole of the 55 certificated heifers gave an average of 272 lbs. of butter fat per head, the 33 second-calf cows averaged 303 lbs. per head, and the 146 cows over four years old averaged 336 lbs. per head for the nine months' term. The whole of the 234 cows and heifers gaining the certificate during last year gave an average of 317 lbs. of butter fat in their nine months' term, and for cows getting nothing more in the way of feeding than they should get in ordinary dairy-farm treatment, this is a very satisfactory performance, and one that should prove very interesting to all dairy-farmers.

When it is remembered that the estimated average yield from the whole of the milking cows in the State is under 150 lbs. of butter fat per year, it is very plain that there must be thousands of very poor-quality cattle in milk to drag the average down as low as this, and the

owners of these unprofitable stock must every year be losing much money and time by retaining them in their herds.

To consider the situation properly, let us recognise that the grazing of each cow will cost not less than 9d. per week. A man who will milk 25 cows is worth fully 22s. 6d. a week and his keep—say not less than 35s. per week altogether, which is equal to about 1s. 5d. per cow. Grazing and milking thus costs, at the very lowest estimate, not less than 2s. 2d. per cow per week, and assuming the commercial value of butter fat to be 1s. per lb., it will be seen that the owner of a cow yielding 150 lbs. will have as profit something less than 9d. per cow per week, or 38s. per year, without making any allowance for upkeep of plant or cultivation of feed. Yet there are many cows, more or less hand-fed, which do not give 150 lbs. of butter fat per year in return. It is very evident that no one can hire labour and make dairying profitable with cows of this class; and the question every dairy-farmer should settle is, "*How many of these inferior dairy stock is he keeping?*"

It is by no means unusual to read accounts in newspapers of the hardships of poor Gippsland dairy-farmers, who are said to be struggling against starvation in their endeavour to make a living from dairying. But what is *not* told is the fact that the "strugglers" amongst dairy-farmers are invariably people who expect to make a success of dairying without any system of working. Hundreds of people keep cows for dairy work and never grow an acre of green fodder for them. How many are there who never weigh or test the milk from any of their cows? How few are improving their annual returns by systematically breeding from their best cows with bulls from tested dairy stock? The actual fact is that the sole claim that the average "strugglers" have to the name of dairy-farmer rests on their dragging a few quarts of milk from underfed and poor-quality cows. They will not try to learn the business properly, and they continue to be "strugglers." Yet, while there are always some people ready to hold up this class of cow-keeper as typical of Gippsland dairymen, there is usually to be found in their immediate neighbourhood, sometimes on adjoining blocks, others who are making good progress on exactly similar land. All through Gippsland, as well as the rest of the State, farmers who carry on dairying on proper systematic lines are doing well. Each year marks some progress in their work, and some monetary advancement. Those who fail to make headway in dairying have usually only themselves to blame, and there is no need to travel far to find evidence of it.

When at Moe recently the writer visited the farms of two dairy-farmers who are typical of the progressive class. One of these is working on country which is still largely in its rough state; while the other, longer established, has his property in full working order. Both grow fodder for their stock; both test their cows and cull out those which are unprofitable; both are breeding on lines that will raise the producing standard of their cows still higher, and both are making arrangements to bring their stud cows under the Government test. These dairymen have no fault to find with their business. They are getting satisfactory results, and can see their way to still better returns. A short account of their farms will not be out of place.

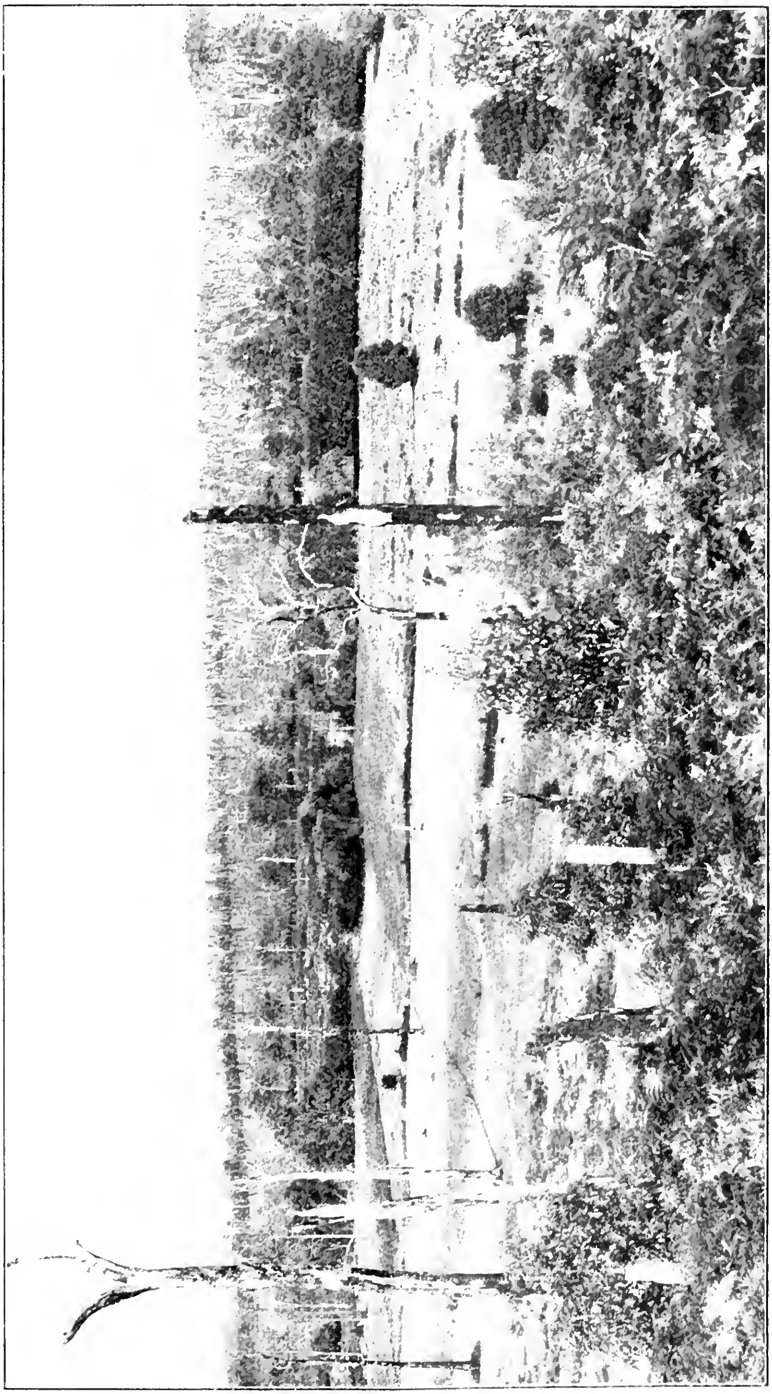
The first property is owned by Mrs. Sefton, and the dairy-farm work is managed by her son, Mr. S. R. Sefton. The farm is

about 1½ miles out of Moe, and has an area of 190 acres, some 40 of which consist of flats bordering on the Narracan Creek, a tributary of the Latrobe, the balance being hill country of a light-grey and rather poor

Mrs. Sefton's Milking Herd.

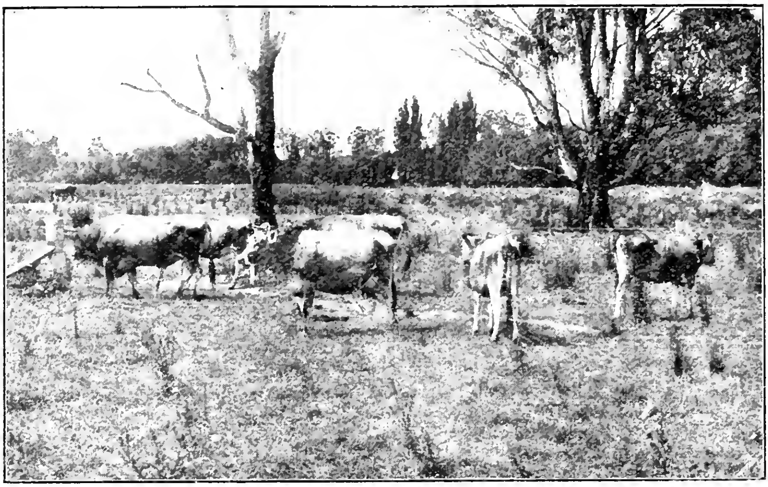
Dairy Heifers at Mrs. Sefton's Farm.

soil. Only about 50 acres of this hill land have so far been made use of. Ten acres have been cleared and twice cropped for hay, and the remaining 40 acres have been cleared of the heaviest of the timber, and



Creek Flats at Moe—Mrs. Sefton's Farm.

this section gives a little grazing. The balance of the farm, 80 acres, is still in the rough bush state.



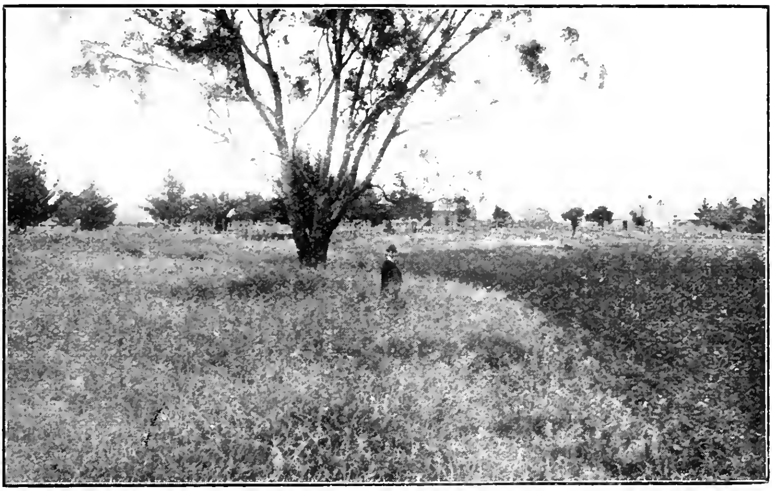
Mrs. Sefton's pedigree Jersey Stud.

Hill Country on Mrs. Sefton's Farm, Moe.

Four acres of peas were harvested from the creek flat this season for pig-feeding, and at the time of inspection 2 acres of maize and 2 of millet were coming on for autumn feeding. Though the grazing on the

hill land is still comparatively light, the creek flats are carrying a good sole of clover, and it is this flat land (less than 40 acres in all) that is at present providing the bulk of the grazing for the 15 cows, 11 yearling heifers, bull, 6 poddies, and 3 farm horses. From the photograph of the uncleared hill land on page 198, it will be seen that this part of the farm is of no use for dairying at present, but if labour were available at reasonable rates to clear it and to extend the cultivated areas, it would be possible to increase the carrying capacity of the farm several times beyond what it now is.

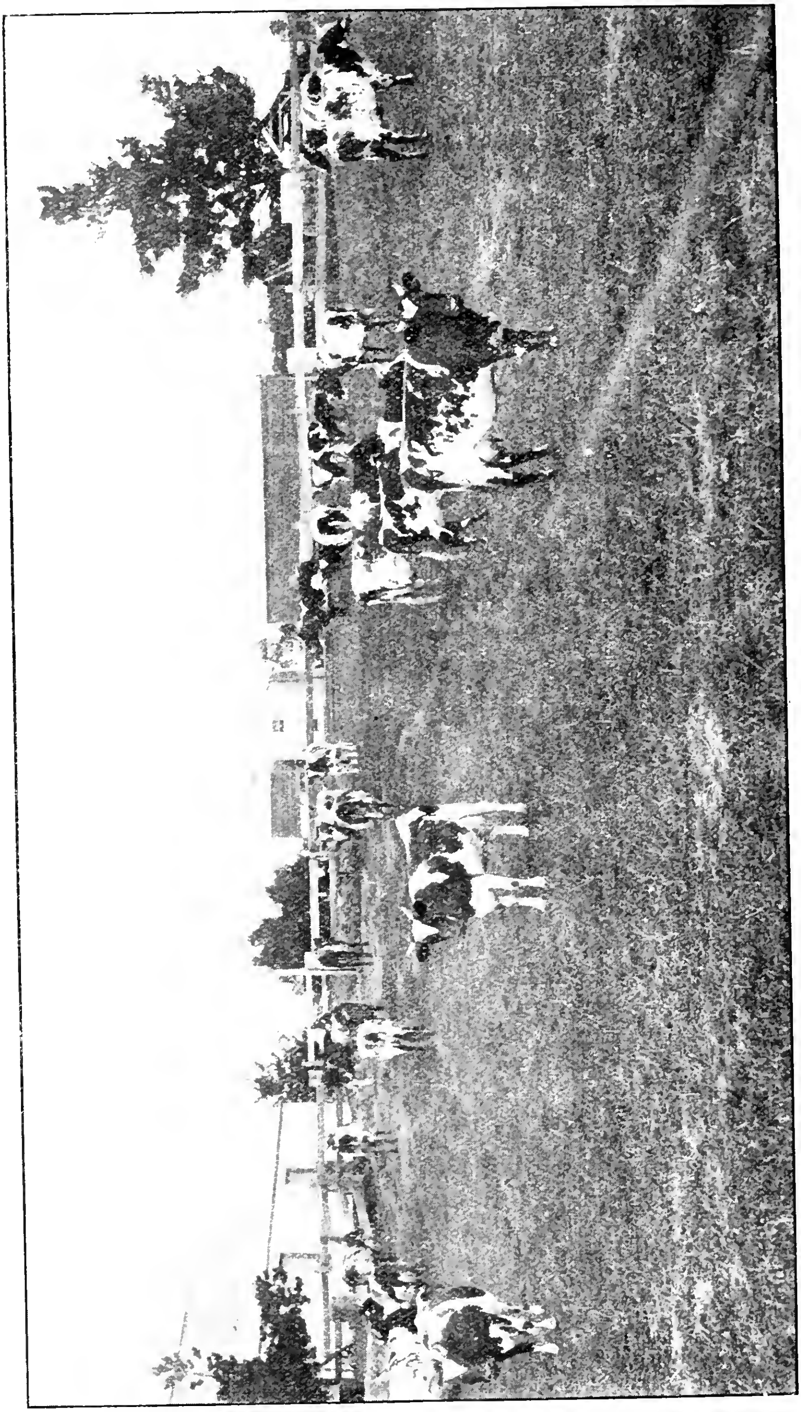
During the year 1917 the total dairy herd of fifteen cows and heifers averaged 199 lbs. of butter fat per head, bringing in an average return of £13 16s. 3d. for cream supplied to the local factory. From photographs taken by the Government photographer at date of inspection, which are reproduced, it will be seen that both cows and yearlings show their Jersey breeding strongly. There are several well-bred cattle



Paspalum on Myrtlevale.

amongst them, and Mr. Sefton has recently added to these by the purchase of some tested stock from a well known Jersey breeder. The several photographs illustrate that even now this farm in its comparatively rough state carries a herd of good dairy quality, and the owner is planning carefully to improve it.

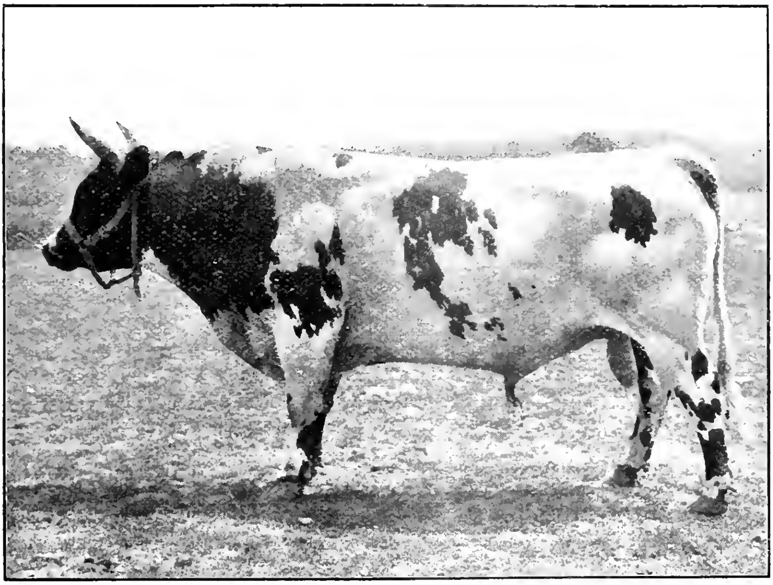
The other farm referred to is Myrtlevale, consisting of 174 acres of flat country about 4½ miles from Moe, and close to the Walhalla railway. This place is owned by Mr. W. C. Gooding, who for seventeen years past has been steadily improving it. The property is subdivided into ten paddocks, and fully four-fifths of it is rich alluvial land. Some 30 acres were under cultivation this season, viz., 20 acres of hay, 6 acres of maize, 2 acres of sunflowers for poultry feed; and smaller areas of mangels, potatoes, and vegetables. The vegetable garden, too often neglected by farmers, and to their loss, is given its full share of attention by Mr. Gooding. With large acreage, and abundance of manure to hand, it is



Myrtlevale Ayrshires.

quite common to see farmers every week taking home purchased vegetables, when a quarter of an acre properly cared for would grow more than sufficient for all requirements. Home-grown vegetables are always cheap; they are on hand when wanted; they are there to be used when fresh and ready, and therefore are much superior in quality to those bought, which are probably gathered some time before being sold, and consequently are withered and dry when prepared for cooking. Most vegetable seeds are easily grown, and the odd time taken up in looking after the home supply of farm vegetables is very well paid for.

Mr. Gooding has also an old-established orchard, which is still highly productive. A small breeding stud of Yorkshire pigs enclosed there turn all windfall fruit to good account. There are at present 40 Yorkshire pigs of various ages on the farm. One of the breeding sows has



Mr. Gooding's Ayrshire Sire.

the record of having given birth to nineteen pigs at one litter, fourteen of which were reared. Mr. Gooding has been very successful in fattening his stock, and on six days this season his pen brought the top price at the Melbourne market, one lot of twelve averaging £8 14s. per pig.

When this property was first bought by the present owner it was in its rough state, and, owing to the heavy scrub which covered it, twenty head of cattle per year would have been its full fattening capacity. It is now carrying a milking herd of 70 cows and heifers, 11 forward heifers, 7 yearlings, 2 bulls, and 63 calves, as well as the farm horses and pigs.

The fine crop of maize illustrated on the next page is of the Sibley variety, and when seen in February was cobbing out well.

Mr. Gooding and his sons have been breeding Ayrshire cattle of a good class for eleven years past, and any one conversant with the breed

will recognise from the photograph of the milkers that they show the even breed characteristics distinctive of an established strain, and that their owner has an eye for good dairy type. This herd has been built up mainly from a combination of the Seafield, Oakbank, and Gleneira Ayrshires, while Willowvale blood has also been introduced. The result is a fine robust class of cows, with shapely udders, good teats, and alto-

Maize at Mr. Gooding's Farm.

gether a type of first quality Ayrshires. The herd of pure cows and heifers shown on page 200 had an average flush yield of $5\frac{1}{2}$ gallons per cow per day, with an average test of 4.2, and six months later still averaged $2\frac{1}{2}$ gallons per day, and were milking evenly.

In the foreground of the view of Myrtlevale farm steading, and on the higher ground of the farm, is a fine growth of paspalum (dilatatum).

This is one of the best grasses for rough country, and though at its best in a warm climate with a good rainfall, yet even in the coldest situations in the Gippsland hills it forms a good sole of pasture, and the close grazing that stock subject it to shows how they like it. As it makes but little growth during its first season, it appears somewhat slow to establish itself, but every plant that takes hold is there to stop. It has a long seeding season, the heads not all ripening at once, and hanging from long stems they swing round with the wind scattering the seed well over the surrounding ground, and thus the number of plants quickly increases unless grazed very closely. It should be noted, however, that it is not advisable to sow paspalum in paddocks which later may be required for cultivation, as it requires heavy discing to get it out of land where it has become established.

In several of the paddocks on the flats near the river there is a splendid sole of strawberry clover, one paddock of 18 acres being particularly good. On river-flat land there is probably no fodder plant superior to the strawberry clover. In some places it has been found to completely overrun established lucerne crops, so that the lucerne disappeared, and it is doubtful whether the milk-producing capacity of such land was at all reduced in consequence.

The farm steading on Myrtlevale is particularly well constructed and cleanly kept—poultry yards, piggery, bull paddocks, and dairy buildings all have their respective positions, and there is none of the "On Our Selection" jumble of stock that is all too frequently in evidence on many dairy farms. From the hang of the road gate to the neat flower garden round the dwelling everything points to system and order, and appearance alone gives the place the stamp of a profitable dairy farm.

Referring again to the subject of this article, only those engaged in the work understand how difficult it is to get some farmers to change from their haphazard unsystematic methods of dairying. Although the use of the scales and the Babcock tester is a far simpler process than sharpening an axe on a grindstone, still it is almost impossible to persuade some cow-keepers to take up this, the only sure method of selecting dairy stock. Some years ago the writer saw a cow being milked that was giving a fair flow of almost colourless milk. A sample taken showed a butter-fat test of .5 *per cent.*, which means that it would take *twenty gallons of such milk to produce one pound of butter fat.* In this instance the owner's curiosity was roused to the point of testing that cow's milk by setting it in a dish, and failing to get any cream from it he promptly slaughtered the animal. As the cow was old, and had been on the farm all her life, the owner must have lost the price of several good cows through having grazed and milked this animal so many years, while she was yielding milk only fit for pig feeding. Possibly, also, she left some progeny which may now be in some non-testing dairyman's herd.

It is an indisputable fact that all over the State there are people working with low-yielding and low-testing cows year after year, when by testing, culling, and breeding on right lines, every cow they own might as easily be profitable producers. Dairying, when properly conducted, is one of the best paying branches of farming, and those who do not find it so are certainly not working on right lines. The use of the scales and tester is the secret of profitable dairying.

APPLE CULTURE IN VICTORIA.

By J. Farrell, Orchard Supervisor.

(Continued from page 140.)

Drainage.

Although the apple is capable of accommodating itself to a wide range of soil and climatic conditions, also geographically both in respect to latitude and altitude, its powers of making a congenial home under the varying circumstances have never overcome its antipathy to wet, sour soils, in which it is obliged to endure the condition commonly known as suffering from "wet feet." Consequently there is no phase of orchard management that requires more careful and prompt attention than drainage. To maintain a healthy and vigorous growth of the trees it is obvious that, during the vegetative periods particularly, the soil should be kept sufficiently moist to enable the feeding roots to absorb, in solution, the different elements of soil assimilated plant food. The condition of sourness created by stagnant water, especially in heavy clays with retentive subsoils in which there is a predisposition to acidity, may be regarded as the antithesis of an essentially favorable environment.

Through want of drainage the soil becomes saturated, its interspaces being thus filled with water which prevents aeration. While the soil is in this temper, beneficial bacterial activity is suspended and sourness or acidity develops. Such a state is also unfavorable to the raising of cover crops for green manure, and when organic manures are incorporated in soil under these conditions, the rate, at which the chemical changes necessary to produce soluble plant food proceeds, is so slow that its accomplishment is often too late to be of much service to the trees during their period of growth. It is often impossible to plough the land in early spring, and when dry enough to be cultivated later, the soil, if tenacious, usually turns over in hard sods. These obstacles and disadvantages involve extra expense by operating against the bringing of the soil into an early and fine state of tilth. When the surface soil is shallow, and often even when cultivated, tenacious subsoils crack during hot weather. These fissures facilitate excessive capillary action, by which the ground to a considerable depth quickly loses its moisture, upon which the sustenance of the trees depends.

Now it is obvious that drained land, on account of the friable character of its physical condition, retains its moisture during the periods of growth better than that suffering from the evil effects of water lodgment during winter.

Trees growing on land requiring to be drained usually thrive fairly satisfactorily for a time, but when an exceptionally wet winter occurs many of them become water-logged, and in many instances die.

The gaseous food breathed in by the tree from the air is elaborated only in proportion to the amount of liquid food used, and the latter not being present in the proper form for absorption, the tree must of necessity starve.

The orchard in which the water-logged tree illustrated in Plate 158 is growing was drained at the time of planting. Wood drains were placed between every two rows of trees, and while these worked well the trees

made good growth and fruited satisfactorily. But when the drain to the right of the tree became blocked up, water lodgment resulted in that direction. Now it is plain that the section of the root system affected by the water was unable to supply the corresponding section of the branch system with food, and the latter consequently died. The soil conditions on the left of the tree are somewhat better—the result of the proper working of the drain on that side, although it will be observed

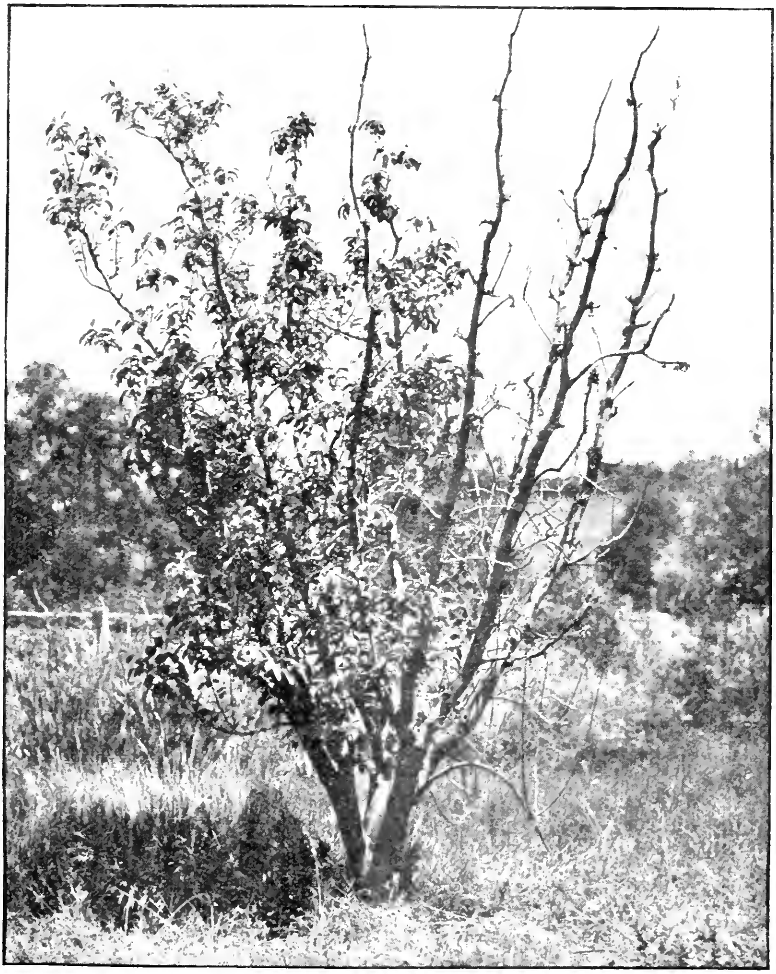


Plate 158.—A Water-logged Tree.

that even here the branches, being sparsely foliaged and lacking vigour, must soon decay unless the water be drawn off and the soil sweetened.

When trees are planted in low positions or on undrained land with retentive clay subsoil, usually in the ordinary course they make good growth for six or seven years. By this time the roots have become firmly established in the subsoil, but as winters of heavy rainfall are

frequent, it is essential that water lodgment at the roots should be prevented by a thorough system of drainage.

Young water-logged trees, before they die, utilize the invigorating materials stored up from the previous year in producing a small quantity of foliage, which, on commencing to wither, gives off an offensive smell, while the bark becomes hard, coriaceous, and assumes a brownish-black colour. If the trees be grubbed at this stage, the main roots will usually be found to be apparently healthy, while the smaller roots and feeding points will be decayed.

Some growers hold that sub-drainage may be obviated by ridging up the land somewhat and planting the trees on the ridges. They claim that the trees, owing to their raised positions when so planted, are protected during winter from the water. This method of planting may result in the trees being protected for a time, but when their roots extend into the depressions, no amount of security obtainable under such conditions can possibly save these roots from water in, or passing continuously over, the lower areas. Then there are others who contend that while excessive water is kept in a state of continual movement no evil effects result from its presence in the soil.

For the purposes of cultural operations and the conservation of soil moisture during warm weather, it is eminently desirable that the surface equality of the orchard soil should be maintained. A mulch of surface soil conserves moisture better than one of subsoil, which has to be employed in the depressions when the ridging-up principle is adopted.

The present writer is convinced that excessive water, whether moving or stagnant, injures the tree, and that the latter is the more damaging, particularly in mid-spring, when it assumes the condition of a sour, residual solution. When drainage is assisted by subsoiling, more moisture is conserved during summer; friable, aerated and sweet soil conditions are more easily maintained, and earlier root-penetration of the lower strata is facilitated.

Statements are occasionally made that, as gums and other native trees make luxuriant growth on land which is neither subsoiled nor cultivated, apple trees should perform likewise. A moment's reflection, however, will convince any person holding such an erroneous idea that the introduced deciduous fruit tree requires more favorable soil conditions, and careful cultural treatment, than does the indigenous forest evergreen, and this, experience has amply verified.

Surface Drainage.

On the approach of winter, provision, through the medium of a system of surface drains, should be made for carrying off the surface water from the orchard during the rainy season. More especially should this mode of drainage be practised in orchards where systems of underground drains have not been established. The desirability of coping with surface water has become very apparent in recent times as a consequence of the almost regular recurrence of wet winters.

An orchard consisting of flat land is usually surface drained by a series of small drains or plough furrows connected at right angles with a head ditch or drain leading to a lower level, whereas the contours occurring in an orchard composed of undulations are made the basis of surface drainage operations.

In both these circumstances, when autumn ploughing, the soil should be drawn towards the trees on both sides, and the furrows created in the centres of the lands serve as the surface drains. When ploughing undulations, the furrows should be at right angles to the ridges, except where the slopes are abrupt and the soil likely to wash away; then the ploughing should be at such an angle to the ridge as would prevent this undesirable happening.

Sub-drainage.

Orchard land may become saturated and the trees water-logged through springs or "spewy" subsoil, by water accumulated from seepage, or by the settling of rain residual water on the orchard area. The last-mentioned condition is of the commonest occurrence, and to prevent or remedy this sub-drainage is mostly resorted to.

The officers of the Orchard Supervision Branch of the Department of Agriculture have for a long series of years persistently advocated sub-draining, and their efforts have been so successful that, at the present time, almost all the orchardists of the State realize that its practice is essential in those orchards whose subsoils do not offer free natural drainage.

The favorable soil conditions accruing from sub-drainage, by offering better facilities for winter spraying, pruning, and early spring cultivation, &c., as well as the splendid results in fruit, which are being obtained from the extensive areas now sub-drained, most convincingly demonstrate the desirability of this practice.

The matter of draining orchard areas when brought under irrigation, whether channel or dam system, should receive careful and prompt attention. Surplus irrigation water lodging on impervious clay subsoils creates unpleasant conditions for the trees, although the results are generally much less injurious than those produced by winter and early spring lodgment.

The subsoils of the pine ridge portions, especially, of the northern irrigation areas mostly offer free drainage, but the conditions for trees growing on those parts with retentive clay subsoils are considerably improved by sub-drainage.

The best and most convenient time to drain an orchard is during winter, when the subsoil has become sufficiently moist to make it amenable to ditch excavation, and labour is at that time more easily obtained. Tile drains, as a result of experience gained during recent years, are now almost exclusively employed. To thoroughly drain an orchard it is generally conceded that a drain should be placed between every two rows of trees. Pipes 2 or 3 inches in diameter, according to the length of the drains, and the extent and nature of the area to be treated, are used for the lateral drains, which are constructed so as to discharge into an open ditch or joined into a main drain constructed of 4-inch pipes.

The best results are obtained when the drains are placed from 2½ to 3 feet deep in the ground, according to the depth of surface soil; if made shallower the water table, practically created in the soil by the working of the drains during the early spring, is usually at too high a level to afford maximum feeding facilities for large trees when their roots have penetrated well into the subsoil. If the drains are dug too deep, the

greater body of excavated subsoil, on being returned to its original position, often becomes puddled, and forms a catchment for surface water.

In planning the sub-drainage system of an orchard composed of level land, it is often preferable to provide an open head ditch, into which the lateral parallel pipe drains are made to deliver the water, rather than connect them with a 4-inch main pipe drain. The bottom of the ditch should be from 4 to 6 inches below the point of water delivery from the pipes so that the latter may not become blocked up with silt, &c. The ends of the pipes entering the open drain should be covered with galvanized wire netting, ½-inch mesh, to exclude rats and other vermin.

When minor surface inequalities occur in the plane of a slope to be drained, these may be overcome by altering the depth of the lateral drains at the various points where required to insure gravitation to the main drain. Where several planes, with possibly various degrees of decline, are involved in the drainage system, however, main drains, whether open

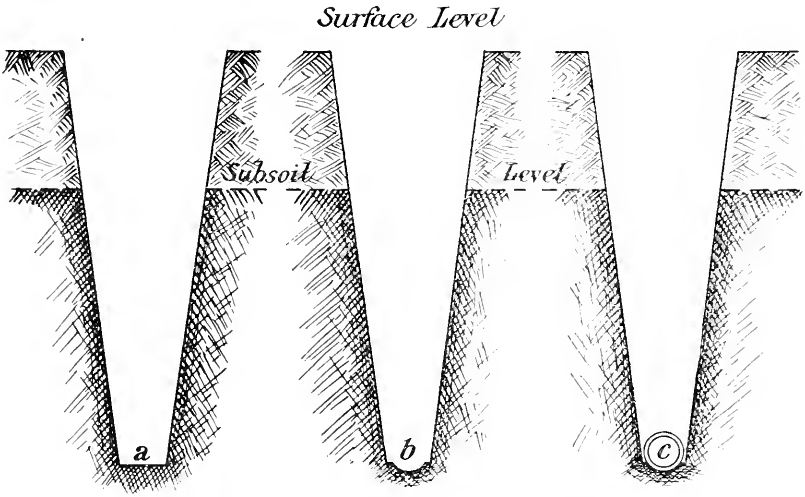


Plate 159.—Cross Section of a Tile Drain.

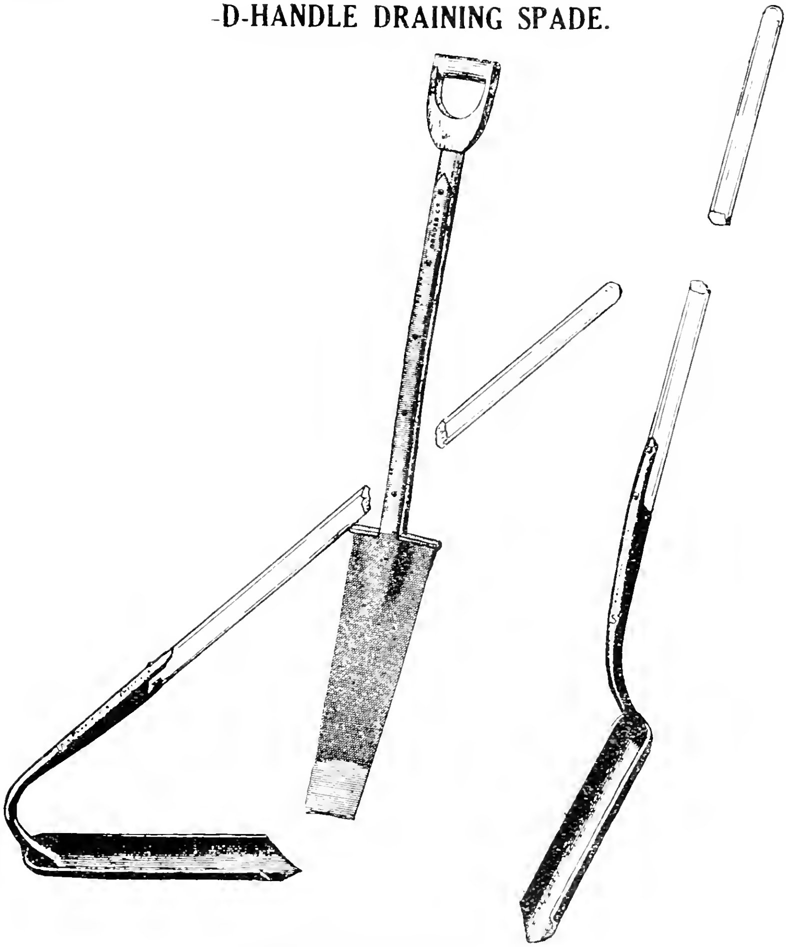
or piped, must be carried systematically along the lowest parts. The small parallel drains of each plane should, when practicable, run directly down the greatest fall, and junction at the necessary angles with the larger drain.

Steep inclines, owing to cross impervious under-strata or spewy subsoil, need under-draining more than much less abrupt slopes which offer better natural drainage.

Plate 159 depicts in cross sections a tile drain in course of construction. When the soil lends itself to free working, the drain excavation is usually commenced by opening up as deep a furrow as possible with the plough. This is made deeper still by the use of an ordinary spade, a special draining spade completes the work, as shown at (*a*). A draining scoop cuts out the portion of clay marked (*b*), thus rectifying inequalities in the grade of the bottom decline, and offering a solid and suitable bed for the tiles. The drain pipe (*c*) is shown in position on the tile

bed and before the ditch is filled in. Where hard and tenacious subsoils exist, however, excavation is more difficult, and a considerable amount of pick and shovel work is often involved. Ordinary unglazed, porous, 12-inch kiln-burnt tiles are mostly used, and when placed in position they should fit closely together. When filling the drains the subsoil should be returned first, and as far as possible the soil should be restored to its former position.

D-HANDLE DRAINING SPADE.



DRAINING SCOOPS.

Plate 160.

The D-handle draining spade and draining scoops figured in Plate 160 are of the pattern commonly employed for drainage work. The blade of the spade is 16 inches long, 6 inches wide at the foot-rest, and 4 inches at the edge. The scoops, whether made on the pull or push principle, are of a width suitable for hollowing out a bed to suit the size of the tile.

Plate 161 illustrates a longitudinal section of tiles in position underground.

A study of the different systems of drains figured in Plate 162 will enable the reader to draw fairly accurate conclusions of the way the soil water gravitates to the drains and is carried away in each instance. Assume that, in the case of Fig. 1, the land is flat, and that the black dots denote the positions of the trees. The land being level, the soil water finds its way, as the six small arrows radiating from each tree indicate, to the six lateral drains, the positions of which are marked by the long arrows. These drains deliver the water into the larger head drain or ditch, whose position and decline are indicated by the long arrow at the base.

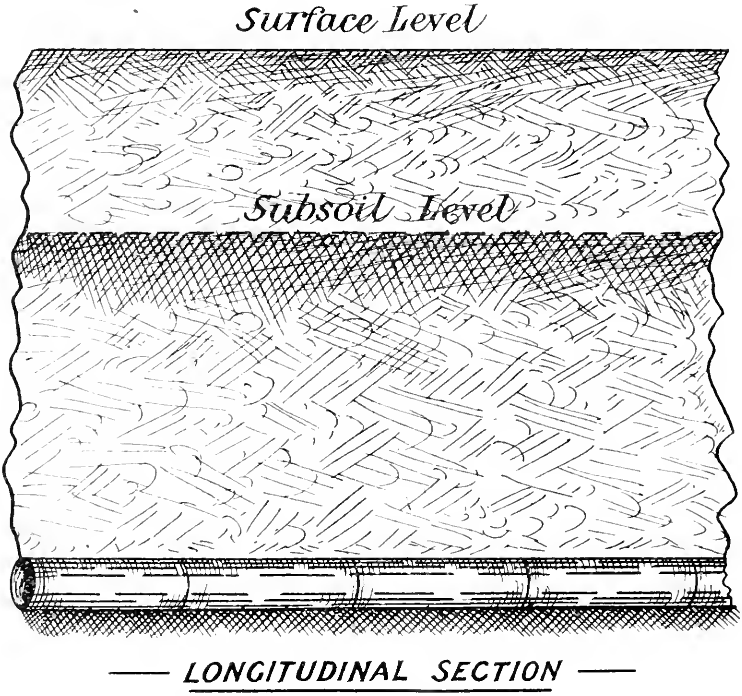


Plate 161.

It will be observed that the drains in the area shown in Fig. 2 are similarly placed to those in Fig. 1, but as there is a decline in the direction of arrow (A), the water will be more inclined to find the lateral drains, as depicted by the small arrows in this figure.

The drained area appearing in Fig. 3 is in the same plane as that shown in Fig. 2, but in this instance a system of diagonal drains is illustrated. The small arrows, under these conditions, also show the fall of the water to the drains. Practically the same length of drains is involved in the diagonal system as that shown in the square method, which represents an area of similar extent, but as the tendency of the soil water is to move from tree to tree before finding its way to the

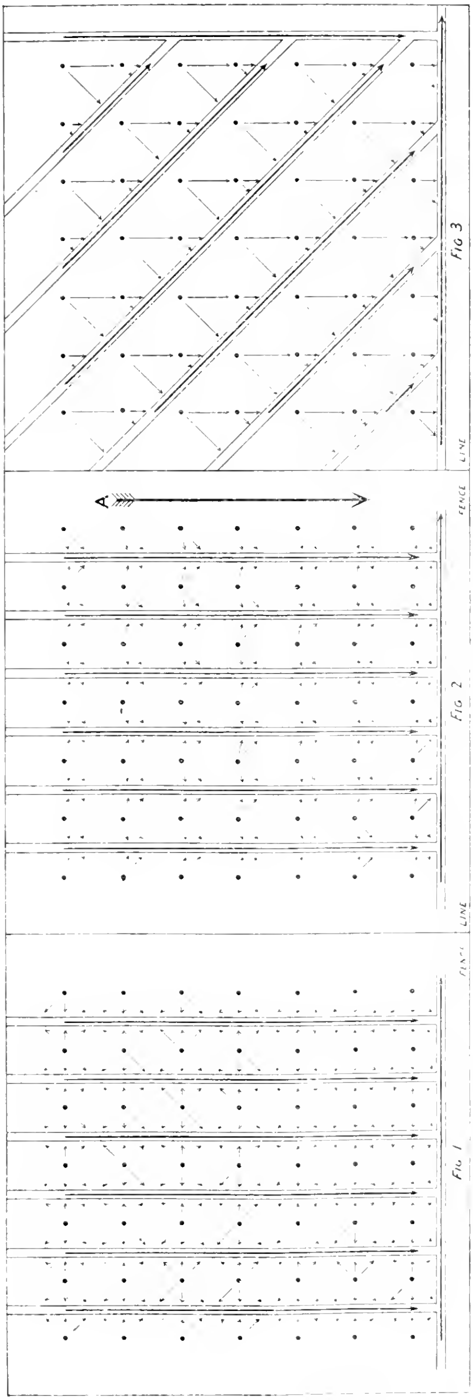


Plate 162.

Fig. 1 shows how the water, represented by the small arrows, gravitates to the drains when the land is level; Fig. 2, when the slope is in the direction indicated by A; and Fig. 3, when the fall is in the same direction, but when diagonal, lateral, parallel, drains are employed.

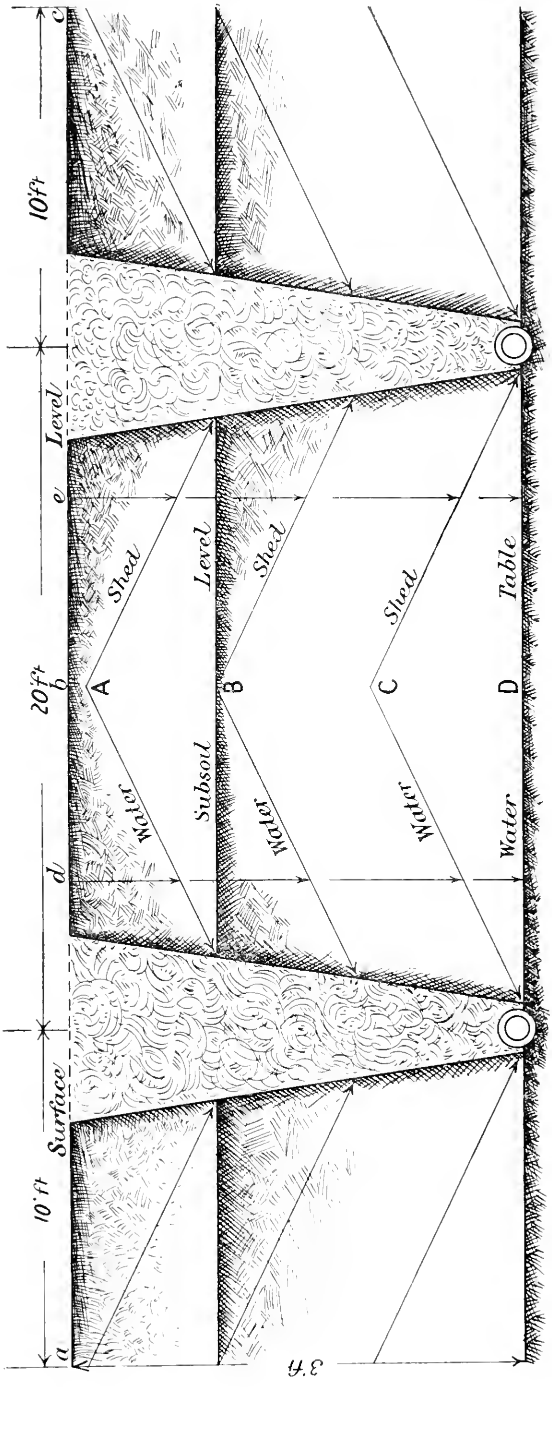


Plate 163.—Cross Section of two drains, showing how water recedes and soil becomes aerated.

diagonal drains this method is not advocated for general adoption. Further, the movement of water in drains placed diagonally across the plane of a slope is not as rapid as that flowing with the fall. Where depressions running longitudinally occur in the plane of the area to be drained, however, drains may be placed in these with advantage, and connected with head drains as shown in the illustration.

Plate 163 gives cross-section of two drains, and shows the lowering of the water in the soil due to the working of the drains, and soil aeration. The arrows from (A), (B), and (C) represent, for the purpose of illustration, what may be termed sub-surface watersheds, or the points to which the surplus water has receded from the surface until the water-table (D) is formed on a level with the bottom of the drains. The air enters at the surface, as shown by the arrows (*d*) and (*e*), and fills up the soil inter-spaces as the water recedes. The soil around the drains is also aerated by air drawn up the pipes.

(To be Continued.)

In a recent article in *Country Life* it is maintained that the intermittent bearing of fruit trees can be avoided by a proper system of manuring. The writer, H. Vendelmans, says:—"In spite of a very common belief, it is certain that the bearing capacity of fruit trees is not limited to every other year. Ninety-nine orchardists out of every hundred in England assert that a good crop is followed by a thin crop, and *vice versâ*, but the regularity with which excellent returns are obtained annually from espalier trees and trees under glass, which receive different treatment from that meted out to orchard trees, ought to suggest some scepticism about the old tradition. In the case mentioned, it is possible to rely on good crops every year. Among the reasons which explain this more regular bearing, manure takes a first place. Without it, the abundant crop of one year makes so great a demand upon food that the reserves of the trees are exhausted, and are not strong enough to feed a new crop for the next year. Hence a poor return follows a good return. In the year following the bumper crop the trees often carry no fruit at all, but they accumulate new reserves, and are then ready to feed a large crop the next year. When the exhaustion of the trees is prevented by appropriate manuring, bearing takes place much more regularly.

In manuring fruit trees, it is necessary to bear in mind that the blossom buds are formed the year before they come out—that is to say, during the period of bearing, or shortly afterwards. Consequently, they are forming at a time when the trees are being exhausted, or have been exhausted. Therefore, a liberal supply of easily assimilable manure, must be placed at their disposal during this period. Liquid manure, wood ashes, basic slag, and lime should be used, taking into account that a superabundant supply of nitrogen might lead to a production of wood instead of flower buds, and that phosphates assist largely in developing the flavour of the fruit.

FURNITURE AND TIMBER BORING INSECTS.

C. French, Junr., Government Entomologist.

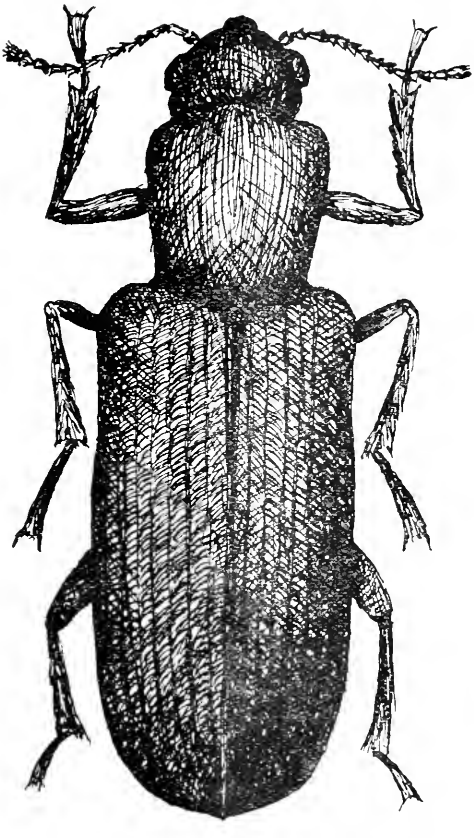
From the many reports and inquiries that have been made during the last few years, it is evident that householders throughout Victoria are suffering very considerably from the depredations made upon their valuable and useful furniture and objects of domestic use by the insects well known as "wood-borers.". These pests often commit great destruction in the beams and other wood-work used in the frame-work of houses, as well as in floorings and articles of furniture, producing the result known as "worm-eaten." The external indications of the presence of these destructive insects are usually twofold—small circular perforations in the surface of the wood, and little heaps of yellow dust on the ground beneath. The perforations are the entrances to, or rather exits from, long cylindrical tunnels traversing the timber in various directions, generally in that of its length, and they are often so numerous as to leave only the narrowest of partitions between the tunnels, and thus reduce the whole interior to a mere net-work, so fragile that it will crumble away on the slightest touch, though to outward appearances the wood seems perfectly sound, except for the few perforations. The beetles are not very often seen, as they spend a large proportion of their lives in their burrows, and, like white ants, prefer to work in the dark. During the course of their lives they undergo metamorphosis, *i.e.*, change of form. First of all is the egg, secondly the larva, grub, or caterpillar, thirdly the chrysalis or pupa, and fourthly the perfect insect or imago.

The chief timber-boring insect of the whole variety is the Furniture or Powder-post Beetle (*Lyctus brunneus, Stephens*). This small beetle, which is dark-brown and sometimes almost black in colour, measures 2 lines in length, and, unfortunately, is too well known to timber merchants, architects, builders, householders, and furniture manufacturers to need much description.

The female deposits her eggs on the outside, underside, and ends of the timber. They hatch very quickly, and the larvæ at once commence to work into the wood. The beetles are easily detected, for they and their larvæ feed on the timber, and some of the sawdust, which is passed through them, can usually be seen collected in small heaps. It is not always possible to detect them before the damage is done, as sometimes they commence boring underneath the boards, joists, and other timbers of buildings, and thus their presence is not suspected until the timber begins to fall to pieces. It is difficult to say with accuracy how many broods of these "wood-borers" are hatched in a year, but from my experience I should say that there are four. However, careful consideration will have to be given to this matter, before it can be definitely settled. The perfect insects are found in the timber all the year round. Occasionally in hot weather they may be seen emerging in large numbers from wickerwork and rattan furniture, and thence transferring their attention to any kind of timber that is handy. The backs of book-cases, cupboards, and the inside woodwork of pianos are particularly liable to attack, and ordinary table legs and wickerwork furniture seem to be among their favourite breeding places. Should they be noticed in numbers on the curtains and blinds of houses, it would be advisable, before

they commence their boring operations, to have the whole place fumigated with hydrocyanic acid gas or bisulphide of carbon. Several houses have recently been treated with this process, and the results have been most satisfactory. It would be advisable, when using these chemicals, to obtain the services of an expert, as great care is required in using them.

During the last few years, the "wood-borer" has undoubtedly made much headway in many parts of Australia, and in this State we have had our share of its depredations, principally owing to the fact that

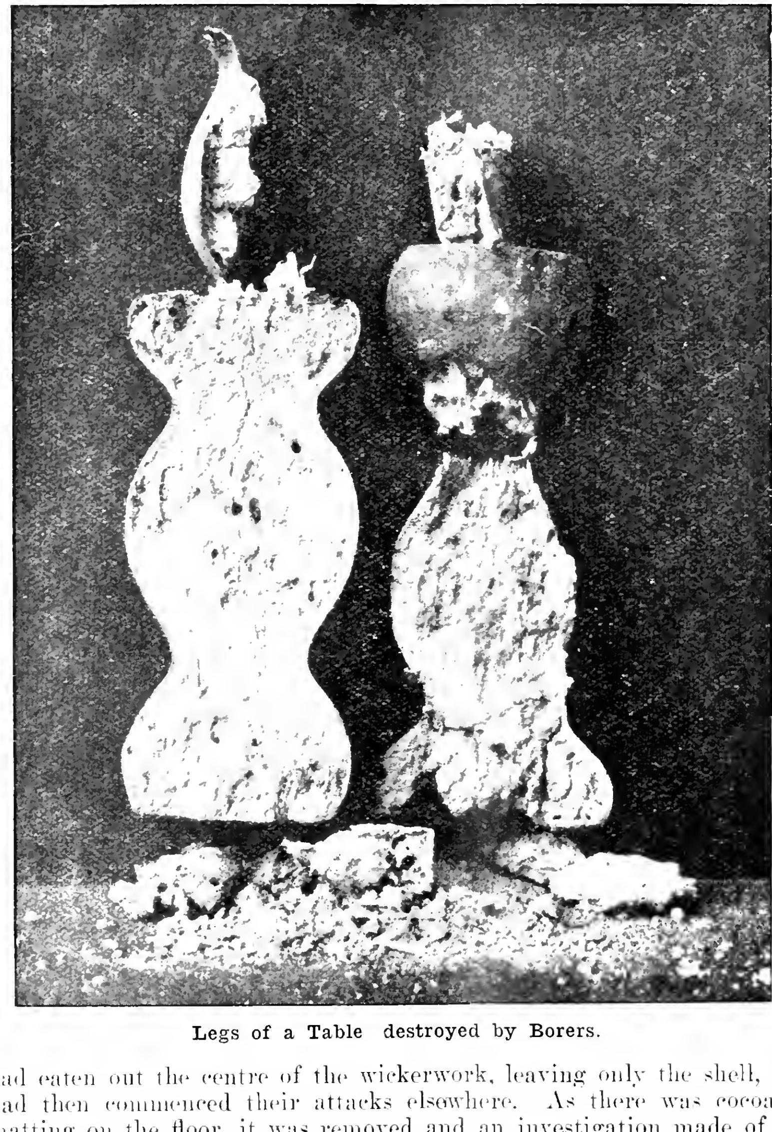


Furniture Beetle (*Lyctus brunneus*).
(Enlarged seventeen times.)

badly-infested timber, tool handles, bamboo furniture, &c., have been allowed to be imported into Australia. It has been stated in the press and elsewhere that imported timber on arrival here is infected on the wharfs; but such is not the case, as I have examined large shipments of timber on arrival here, and found them to be already badly infested with these insects.

The furniture beetle is found in most parts of the world, and has been known to science since 1862. It was probably first introduced into Australia in wickerwork, rattan, or bamboo furniture, tool handles, or

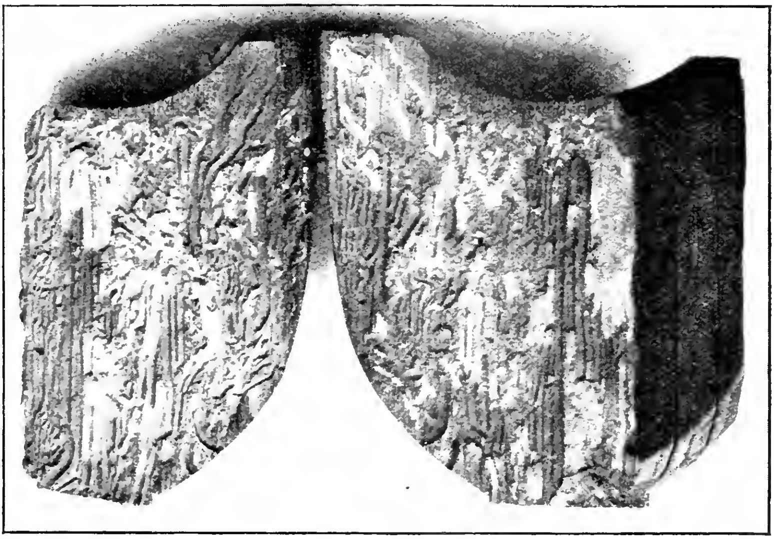
timber from abroad. I have seen wickerwork baskets absolutely crumbling away through the work of this borer, and it is from such articles that houses are often infested, and no end of trouble caused. Not long ago I was shown a clothes-basket, which I was told was full of grubs. On visiting the store-room, I noticed a sawdust-like material falling from the basket, and on pressing the sides it completely collapsed. The insects



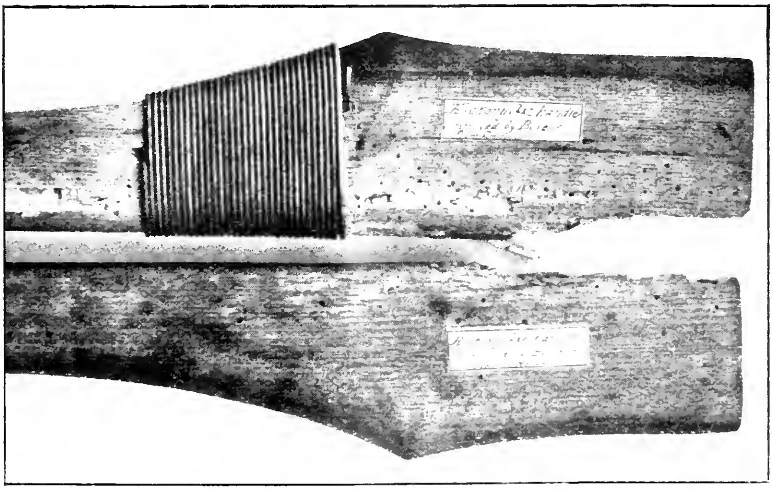
Legs of a Table destroyed by Borers.

had eaten out the centre of the wickerwork, leaving only the shell, and had then commenced their attacks elsewhere. As there was cocoanut matting on the floor, it was removed and an investigation made of the flooring boards. No trace of borers could be seen on the top of the boards, but on opening the cellar and examining the underneath portion of the floor, it was found that it had been completely riddled, and in a

short time would have collapsed. Once, close to Melbourne, I visited a fine house, where nearly every joist in the roof had been riddled by borers, and they had then commenced their attacks on the furniture in the dining and other rooms. This shows the advisability of having man-holes in the roofs of buildings, so that an examination of the roof



Spade Handles destroyed by Furniture Beetles.



Axe Handles destroyed by Borers.

supports may be made from time to time. In the case of the house referred to the wood had been affected before it was placed in the building, as the place had been erected for only a short time, and all the infested timber had to be taken out and replaced by the builder at his

own expense. Builders and architects will thus see the wisdom of carefully examining timber before it is used in the construction of buildings.

It would be well if all timber, tool handles, bamboo blinds, wickerwork, and other furniture arriving here from abroad were examined on arrival and, if found to be badly infested with borers, condemned and destroyed; but if only slightly affected, they might be treated with some of the remedies enumerated at the end of these notes.

Many assertions have been made that furniture beetles attack hardwoods only, but such is not the case. In fact, in the hardwood timbers affected by them which I have seen, the ravages have not gone beyond the sapwood; and if timber merchants see that this section be removed, builders and others need have no fear in using these fine woods. In the case of hickory, cedar, New Zealand kauri, blackwood, ash, deal, oak, and numerous other woods, the borers certainly do not confine themselves to the sapwood only, but will riddle them through and through. Often when they attack old timber in houses, they reduce them to sawdust in a very short space of time. Examples of infested timber taken from dwellings are illustrated, and these and other samples may be seen at the Entomological Museum attached to the Department of Agriculture.

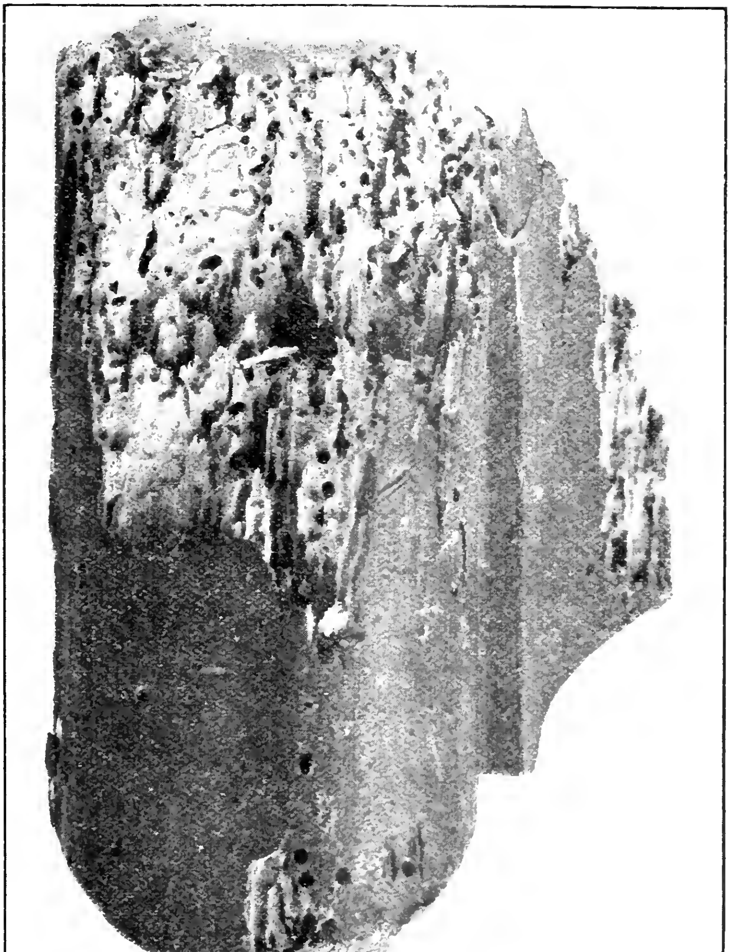
The efforts of the Powellised wood process against white ants have been very successful, and there is no doubt that the same process would be successful against timber borers. The difficulty experienced in destroying the different kinds of wood-boring beetles in the various stages of their existence is very great, because, as already stated, in some cases the damage is done before the insects are noticed, and in others the wood is infected with the larvæ of the beetles prior to its being cut up and used for building purposes, or made into furniture.

All timber should be dried as soon as possible, and not allowed to remain closely packed in timber yards for any length of time. Unfortunately some timber merchants allow the timber fresh from the forest to be packed with timber which has lain in the yard for a considerable length of time. This is a bad practice, and sometimes it is from such places that infestation comes. A good system, which is adopted in Tasmania, is to allow the timber to remain in the open air for a period of about eighteen months. This allows the hardwood to become thoroughly dried.

In Victoria there is a process of artificially seasoning timber, which is called the House process. The inventor, Mr. House, of the Forest Department, Melbourne, states that the process comprises an insulated chamber, into which the stacked timber is run on trucks, and subjected to moist and dry heat from a system of steam pipes and cells, the temperature and humidity being regulated by drop doors and ventilators. The chamber and its accessories form practically an easily adjustable machine, saturating the timber, washing out the free water in the cells and the chemicals in the sap of green timber, and so doing nature's work of five years in about a fortnight. Naturally the time required for drying varies with the thickness of the timber—twelve days sufficing for 1-in. planks and up to sixteen days being required for planks of a thickness up to 1¼ inches. Personally I know little of this process, but Mr. J. Mann, of the University Engineering School (an expert regarding timber matters), says, " The timber dried in this manner does not appear to be damaged in any way, the colour being good and the fibres normal.

I consider the results equal to anything yet put on the market in the way of artificially seasoned timber for flooring boards."

Another source from which clean timber imported from the other States and abroad is liable to infestation, is some of our own timber yards, for I have seen several where the timber was badly infested with furniture beetles. As the timber merchants in the other States, espe-



Portion of a Window Sill destroyed by **Furniture Beetles.**

cially Tasmania, are taking every precaution to remove all sapwood and send us absolutely clean timber, it behoves the timber merchants in Victoria to do their utmost to keep their yards free from the borer trouble, otherwise the fine imported timber which we now receive will become infested. This would create another scare, and do a great injustice to our Inter-State neighbours.

As the bark on the trees is a favorite breeding place for most wood-boring insects, it should be removed as soon as the tree is felled. Firewood cut in the forest and left on the ground is often attacked by borers, and so becomes a medium by which the pests are brought within reach of houses and furniture. Telegraph poles, flooring boards, mine props, &c., if attacked, or even if not attacked, since prevention is better than cure, should be treated with one of the following:—Corrosive sublimate, linseed or other preservative oils, kerosene, benzine, creosote, white ant preservative, carbolic acid, white ant exterminator, benzine mixed with carbolic acid, or carbolinium. Axe, spade, and other tool handles, spokes, naves, &c., infested by borers should be treated by being soaked in preservative oil for 24 hours. Preservative oil is highly recommended by Mr. W. W. Froggatt, F.L.S., Government Entomologist of New South Wales, who states that floor joists, after they are laid, should be thoroughly dressed with the oil, to which has been added one pound of arsenic to one gallon of oil. Personally, I am diffident about recommending arsenic for treatment of timber against borers (especially in buildings), but as Mr. Froggatt, who has had a long experience with timber borers, has recommended this method for years, and no harm has come to those following it, I am quoting him. I have used preservative oil without the arsenic, and the results have been very satisfactory. The oil penetrates into the timber, and destroys any insect in the tunnels. Floor joists that have been dressed with creosote are immune from the attacks of borers.

Dr. A. D. Hopkins, in charge of forest insect investigations, Department of Agriculture, United States of America, who has devoted much time to the study of forest insects, writes as follows:—

Timbers and Woodwork in Structures.

(1) Use nothing but heartwood for the concealed parts most likely to damage.

(2) If it is necessary to use all part sapwood material, attack can be prevented by treating the sap portions with kerosene, coal tar, creosote, or linseed oil. Facilities for future treatment can be provided wherever the rough or finished woodwork is exposed, as in outbuildings, bridges, &c., if care is taken to expose the sapwood.

(3) If the untreated timbers and woodwork in old buildings show evidence of attack, the affected portions should be given a liberal application of kerosene.

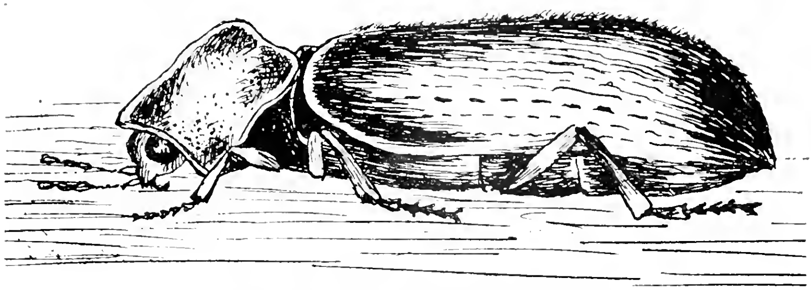
THE PIN-HOLE BORER (*Anobium sp.*).

Another insect which causes considerable damage to timbers, &c., is the "Pin-hole Borer." It is scarcely one-sixth of an inch long, of a dark-brown colour, and, as in the case of most of its allies, its head, being well sunk in the thorax, has the appearance of a hood or cowl, or if seen sideways reminds one of a bonnet which almost envelops the head.

The adults of this class of wood-boring insects place their eggs on the wood. The minute worms hatching from the eggs bore directly into the wood, forming at first holes so small that they are scarcely visible to the naked eye. They do not stop in the sapwood as do some kinds, but extend their burrows to the very heart of the tree, each worm

making for itself a separate burrow, in which it remains until matured. The borings and excrements from the wood are pushed out from the original entrance by the borers, as they move backwards and forwards, which they must frequently do, both to clear the burrows and to enlarge them to accommodate the increasing size of their bodies. Thus the holes made by these insects are found to vary in size, and to extend several feet through the wood.

In its larval condition this insect is a thick fleshy grub, somewhat curved and swollen at each end. It is of a whitish colour, as might be expected in a creature which spends its time in the darkness of a tunnel. The larvæ are very seldom seen, as in order to reach them, the wood in which they are domiciled must be pulled to pieces; but various chemicals may be used to penetrate through the wood in order to destroy them. Their food consists of the wood itself, which by their powerful though tiny jaws is bitten off in minute particles, and many of these are left uneaten, and either clog up the burrows or are ejected at their openings, where they form the tiny heaps of yellow dust previously mentioned. No wood is so old and dry that they cannot extract



Pin-hole Borer (*Anobium domesticum*).
(Enlarged fourteen times.)

nourishment from it—in fact, the older and drier it is, the better they like it. The pin-hole borer changes into a chrysalis in its burrow, and envelops itself in a silken cocoon, in which are interwoven particles of the dust made by the insect. The tunnels made by the pin-hole borer are about twice the size of those made by the furniture borer, and look as if they had been burnt out. At times the pin-hole borer bores right through the timber, the holes often being so straight that a string could easily be passed through the openings for several inches. When found in woodwork out of doors, the direct damage caused by actual excavation and devouring of the wood by insects of this kind is not the only injury for which they are responsible, for damp air enters the substance of the wood through the burrows, and meeting there the excrement, stored in great quantities, the tunnels become good bases for the growth of fungi, whereby the decay is rapidly accelerated. Pin-hole borers have been known to attack redgum, mahogany, beech, oak, deal, and red pine. I fully agree with Mr. J. Mann, of the University, who has carefully studied the borer question, that very few timbers are totally immune from the attacks of these insects. The prevention and remedies recommended for the furniture borer will suffice for this species also.

WHEAT MANURIAL TRIALS.

Five Years' Results.

By H. A. Mullett, B. Ag. Sc.

When superphosphate was first introduced as a manure for wheat and dressings of 56 lbs. and even lower than that were advocated, to many it seemed beyond the bounds of common sense that so small a dose could appreciably affect yields. The grounds for this early scepticism are not hard to understand when it is remembered that the top three inches of soil weigh between 300 and 400 tons, and that actually only a fraction (about one-fifth) of the small dressing is of direct benefit to the plant. To-day so widespread is the use of "super" on our Australian wheat soils and so consistent are the results, that the phenomenal response of the average soil to the manure has become commonplace, and it is only when the seed drill happens to miss sowing the regular quantity of

Ploughing Manurial Plots at Werribee.

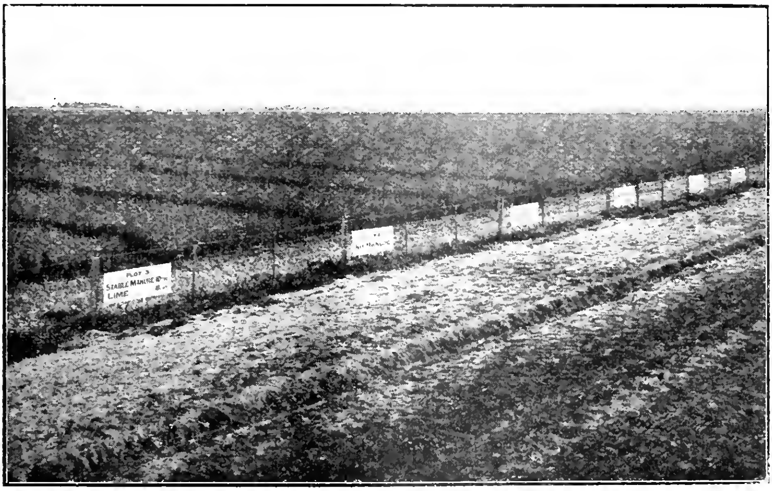
manure that the farmer is reminded of the vital part which this light dusting plays in producing profitable yields.

The Importance of Determining the Most Profitable Dressing.

The problem of to-day is not, however, one in which the advisability of the use of superphosphate is questioned, but rather to ascertain how much to use. It can be shown that this quantity varies with a number of factors, and that its determination with some degree of precision is a matter of considerable importance. Experiments show that on most soils there is a steady and proportionate increase in the yield as the amount of manure applied is increased until a point is reached after which the same ratio is not maintained, until eventually there is no response to further dressings. Obviously, then, in practice it is necessary to determine the manurial application which gives the greatest net profit, and this is not necessarily that which gives the highest yield. It will follow, also, that the higher the price of wheat the greater will be the

value of the increase produced by the manure, and consequently it will pay when the price of wheat is high to give a somewhat heavier dressing than when the price is low. Reference to any of the attached tables, on which the net profit is calculated on the basis of wheat at 4s. a bushel, will demonstrate that if wheat had been calculated as worth 4s. 9d. a bushel still heavier dressings than those indicated would have been profitable. Conversely, if wheat fell to 3s. 2d., somewhat lighter dressings would have been the most profitable. A perusal of the tables for the yields will show that it is well within the capacity of moderate dressings of superphosphates on many wheat soils to double the yields, or at any rate to produce net profits in the vicinity of £1 per acre over and above the cost of the manure. Hence the importance of accurate manurial determinations is strikingly demonstrated.

Owing to the seasonal fluctuations, fairly wide differences in the results are obtained, but when the results of a number of years are con-



Half-acre Manurial Plots at the Research Farm, Werribee.

sidered such differences tend to be eliminated, and the figures so obtained furnish a more reliable basis for use in practice. Such determinations would probably be made on many farms if there were ready facilities for insuring accuracy of results; further, the expense of conducting the trials has to be considered. At each of the State farms, however, portion of the area is devoted to annual manurial trials of a permanent character. The crop is sown on fallow ground and is located on the identical spot each year, so that the cumulative effect of the manures applied is determined in each case. Full precautions are taken to insure accuracy of the results, and the produce is weighed. Besides superphosphate, a number of other manures and combinations of manures are tested side by side in plots. Each plot is half an acre in area, and the whole field is treated as far as possible just as it would be on a farm. Federation wheat is the variety sown.

RESULTS, QUINQUENNIAL PERIOD, 1913–17.

Longerenong.

Treatment.	Yield.					
	1913.	1914.	1915.	1916.	1917.	Average for 5 Years.
	bush.	bush.	bush.	bush.	bush.	bush.
No Manure	17·4	3·0	37·5	35·8	27·8	24·3
Superphosphate ½ cwt. per acre ..	25·6	5·1	49·4	35·7	36·2	30·4
Super. 1 cwt.	29·1	5·8	51·3	36·0	35·0	31·4
Super. 2 cwt.	29·6	6·1	54·7	39·2	35·8	33·1
Super. 1 cwt. + Lime 5 cwt. ..	29·0	6·7	52·2	36·8	23·7	29·7
Super. 1 cwt. + Lime 10 cwt. ..	29·8	7·1	49·8	37·4	24·8	29·8
Super. 1 cwt. + Nitrate Soda 40 lbs., with seed	30·6	6·4	46·9	38·8	23·3	29·1
Thomas' Phosphate 1 cwt.	18·8	4·5	40·9	38·5	29·3	26·4
Super. 1 cwt.	30·0	6·6	49·9	36·4	26·8	29·9
Super. 1 cwt. + Nitrate Soda 40 lbs.. Sulp. Potash 40 lbs.	30·0	6·1	49·2	38·6	30·1	30·8
Super. ½ cwt. + Thomas' Phosp. ½ cwt.	27·6	6·4	46·1	37·6	29·7	29·5
Super. 1 cwt. + Nitrate Soda 40 lbs. (Spring)	34·3	7·1	48·8	36·4	28·6	31·0
Farmyard Manure 10 tons	24·8	4·4	45·7	45·7	31·5	30·4

Rutherglen.

Treatment.	Yield.					
	1912.	1913.	1914.	1915.	1916.	Average for 5 Years.
	bush.	bush.	bush.	bush.	bush.	bush.
Farmyard Manure 10 tons per acre ..	13·3	27·9	2·1	8·4	26·5	15·6
Farmyard Manure 10 tons per acre + Lime 10 cwt.	17·8	28·3	5·5	14·4	30·3	19·3
No Manure	9·4	18·5	·6	6·0	8·7	8·6
Superphosphate ½ cwt.	14·4	28·5	1·8	10·8	15·8	14·3
Superphosphate 2 cwt.	18·7	31·8	2·4	12·0	14·5	15·9
Superphosphate 1 cwt.	16·2	31·0	3·5	15·6	12·7	15·8
Super. 1 cwt. + Sod. Nit. ½ cwt.. with seed	19·0	28·2	3·4	14·5	15·9	16·2
Super. 1 cwt. + Sod. Nit. ½ cwt.. in Spring	17·3	31·8	3·4	11·7	11·6	15·2
Super. 1 cwt. + Sulph. Ammonia ½ cwt.	14·9	29·8	3·4	13·0	10·2	14·3
Super. 1 cwt. + Sulph. Ammonia ½ cwt. x Potash ½ cwt.	12·8	29·3	2·6	13·6	9·7	13·6
No Manure	12·1	20·1	·6	6·0	3·8	8·5
Bonedust (P_2O_5 = 1 cwt. Super.) 1 cwt.	13·8	28·1	1·0	11·7	8·8	12·7
Basic Slag (Thomas' Phosphate) 1 cwt.	13·9	28·2	1·2	16·0	8·3	13·5
Basic Slag (Thomas' Phosphate) ½ cwt.. Superphosphate ½ cwt.	13·4	28·6	1·4	17·5	9·2	14·0
Super. 1 cwt. + Lime 5 cwt. ..	17·4	28·7	2·1	22·0	15·9	17·2
Super. 1 cwt. + Lime 10 cwt. ..	18·3	30·9	1·4	20·0	16·2	17·4
Super. 1 cwt. + Lime 20 cwt. ..	20·2	30·2	1·7	23·0	17·8	18·6
No Manure	12·8	19·1	·3	8·0	4·1	8·9
Super. 1 cwt. + Potash ½ cwt. ..	17·6	31·3	1·1	18·7	8·9	15·5

Note.—Owing to floods the plots were not sown in 1917.

Werribee.

Treatment.	Yield. 1913.	1914.	1915.	1916.	1917.	Average for 5 Years.
	bush.	bush.	bush.	bush.	bush.	bush.
Superphosphate 1 cwt. per acre ..	9·2	14·3	25·6	3·1	7·2	11·9
Farmyard Manure 10 tons	11·8	10·9	24·5	3·9	14·0	13·0
Farmyard Manure 10 tons + Lime 10 cwt.	12·7	8·7	26·5	2·6	14·0	12·9
No Manure	7·5	5·7	20·0	2·1	3·9	7·8
Super. ½ cwt. per acre	11·1	9·3	27·5	2·6	11·1	12·3
Super. 1½ cwt. per acre	14·0	11·6	28·9	2·9	15·4	14·6
Super. 2 cwt.	13·9	11·7	28·2	3·7	14·5	14·4
Super. 1 cwt. + Nitrate Soda 49 lbs. (with seed)	13·6	8·1	30·0	3·3	16·3	14·3
Super. 1 cwt. + Nitrate Soda 49 lbs. (in Spring)	12·6	9·5	30·1	3·5	14·7	14·1
Super. 1 cwt.	13·1	10·8	28·8	3·3	11·7	13·5
Super. 1 cwt. + Sulph. Potash ½ cwt.	12·0	9·1	28·5	3·5	14·1	13·4
Super. 1 cwt., Sulph. Potash ½ cwt. + Nitrate Soda ½ cwt.	12·2	6·4	28·0	3·1	15·7	13·1
Bone Fertilizer 1 cwt.	8·4	3·3	25·3	3·5	8·1	9·7
Thomas' Phosphate 1 cwt.	8·9	4·1	25·5	3·2	7·6	9·9
Super. ½ cwt. + Thomas' Phosp. ½ cwt.	12·1	5·6	26·8	3·5	13·3	12·3
Super. 1 cwt. + Lime 5 cwt. ..	11·8	7·1	28·4	3·0	14·9	13·0
Super. 1 cwt. + Lime 10 cwt. ..	12·3	6·0	27·7	3·2	14·9	12·8
Super. 1 cwt. + Lime 20 cwt. ..	11·5	5·3	27·0	3·4	15·7	12·6
Super. 1 cwt.	10·9	3·8	26·1	2·9	13·6	11·5
No Manure	6·4	5·3	19·9	2·7	5·7	8·0
Super. 1 cwt. (cropped continuously) ..	9·9	10·4	22·7	3·7	8·3	11·0

These tables bring out the striking efficacy of superphosphate as a manure on our Australian wheat lands. At Rutherglen, as compared with the no manure plot, 1 cwt. superphosphate per acre produced an additional yield of wheat worth 28s. 9½d. per acre (wheat at 4s. a bushel) and returned a net profit (after deducting the cost of the manure) of 23s. 9½d. per acre as a direct result of using the manure. Calculating on a similar basis, ½ cwt. superphosphate produced a net profit of 20s. 3½d. per acre. From this it will be seen that by using the heavier dressing the grower was able to obtain 3s. 6d. per acre, or practically an extra bushel of wheat per acre, for nothing except perhaps the trouble of setting the drill to sow at the heavier rate.

Heavy and Light Dressings of Superphosphate at Rutherglen —Five Years' Results.

Treatment.	Yield per acre.	Increase per acre over no manure.	Value of increase at 4s. bushel.	Cost of manure, per acre.	Net profit per acre after deducting cost of manure.
	bushels.	bushels per acre.	s. d.	s. d.	s. d.
No Manure	8·6				
Bonedust	12·7	4·1	16 5	—	—
Basic Slag	13·5	4·9	19 7	—	—
Super. ½ cwt.	14·3	5·7	22 9½	2 6	20 3½
Super. 1 cwt.	15·8	7·2	28 9½	5 0	23 9½
Super. 2 cwt.	15·9	7·3	29 2	10 0	19 2

Note.—The expense of putting in each plot is the same except so far as the manures are concerned.

At Longerenong there has been a steady increase, both in yields and in the net profit per acre, as the dressings increase; 2 cwt. being the maximum amount applied.

As compared with the no manure plot, ½ cwt. superphosphate gave an extra return of 21s. 10½d. after the cost of the manure had been deducted. Calculating on the same basis, 1 cwt. yielded a net profit of 23s. 4½d., the maximum being 25s. 2d. per acre with 2 cwt. super.

HEAVY AND LIGHT DRESSINGS OF SUPERPHOSPHATE AT LONGERENONG —FIVE YEARS' RESULTS.

Treatment.	Yield per acre.	Increase over no manure plot.	Value of Increase at 4s. bushel.	Cost of manure. per acre.	Net profit per acre after deducting cost of manure.
	bushels.	bushels per acre.	s. d.	s. d.	s. d.
No Manure	24·3				
Thomas' Phosp. ..	26·4	2·1	—	—	—
Super. ½ cwt.	30·4	6·1	24 4½	2 6	21 10½
Super. 1 cwt.	31·4	7·1	28 4½	5 0	23 4½
Super. 2 cwt.	33·1	8·8	35 2	10 0	25 2

At Werribee the net profit per acre obtained by the use of ½ cwt. superphosphate was 15s. No increase in the wheat yield was obtained by increasing the dressings to 1 cwt., but the response to still heavier dressings, namely, 1½ cwt., and 2 cwt. respectively, showed that the soil would behave in a similar manner to that of the other centres. The greatest net profit per acre (19s. 8d.) was obtained by using 1½ cwt. super.

HEAVY AND LIGHT DRESSINGS OF SUPERPHOSPHATE AT WERRIBEE — FIVE YEARS' RESULTS.

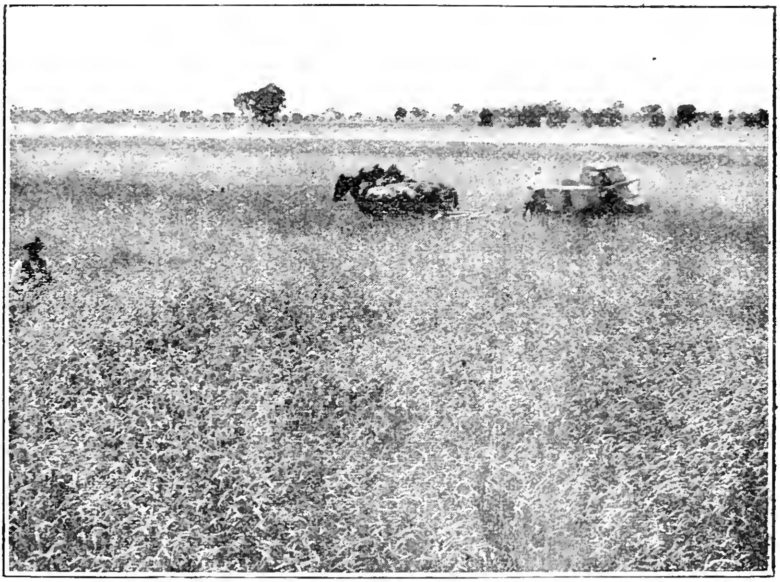
Treatment.	Wheat after	Yield per acre	Increase over no manure plot.	Value of Increase at 4s. bushel.	Cost of manure per acre.	Net profit per acre after deducting cost of manure.
		bushels.	bushels per acre.	s. d.	s. d.	s. d.
No Manure	Fallow	7·8				
Bone Fertilizer	,,	9·7	1·9	7 7	—	—
Thomas' Phosphate ..	,,	9·9	2·1	8 5	—	—
Super. ½ cwt.	,,	12·3	4·5	18 0	2 6	15 6
Super. 1 cwt.	,,	12·3	4·5	18 0	5 0	13 0
Super. 1½ cwt.	,,	14·6	6·8	27 2	7 6	19 3
Super. 2 cwt.	,,	14·4	6·6	26 0	10 0	16 0
No Manure	Wheat	8·0	·2			
Super. 1 cwt.	..	11·0	3·2	12 9	5 0	7 9½

NOTE.—At this centre on two of the plots wheat was grown continuously, one receiving no manure and the other 1 cwt. per acre. It

will be noted that although the annual yield has been practically doubled by fallowing, the total yields of the fallowed and non-fallowed plots were apparently the same. There was, however, great difficulty in keeping the "wheat continuously" plots free from weeds.

. . . .

Summary.—The results form a striking testimony of the efficacy of superphosphate as a manure, and they further indicate to those farmers in districts similar to the centres under discussion, that is to say, to the bulk of our wheat-growers, that heavier dressings than ½ cwt. per acre are likely to prove profitable. On the black soils of the Wimmera, at



Harvesting the Plots at Rutherglen.

any rate, of which Longerenong is thoroughly representative, so definite is the response to heavier dressings that there can be little doubt that the use of at least 1 cwt. of superphosphate should prove highly profitable. The beneficial effect of the heavier dressings on the pastures succeeding the wheat should not be lost sight of by farmers seeking to improve the stock-carrying capacity of their holdings.

The above figures do not hold for the Mallee, where the conditions are very different. Tests during the past four years at representative centres have shown 60 lbs. superphosphate, which is double the present average for this district, to be the most profitable dressing for wheat.

SILO FOR ENSILAGE OR GRAIN.

Plans and Specifications for an 100-ton—All Wood—Building.

By J. Wilson, Silo Builder.

Foundation.

Level off site for a diameter of 18 feet. Drive a peg in the centre of site, and with a trammel 7 ft. 2 in. long describe a circle. Then lengthen trammel to 8 ft. 2 in. by nailing a piece of wood to it, and describe another circle. Excavate to a depth of 6 in. between the two circles, using the loose earth taken from the trench to form a mould for the concrete foundation. The proportions of the various constituents of the concrete depend upon the air voids or spaces in the metal or gravel, and upon the strength of concrete required. The mortar or compo of sand and cement should be sufficient in bulk to fill all the voids in the metal, preferably somewhat in excess, say, about 10 per cent. The voids can be found by filling a kerosene tin with the metal or gravel, making a bulk of 4 gallons; the whole is then weighed, allowance being made for weight of tin. Water is poured in until flush with the surface, and the tin with its contents is again weighed. Thus, as water weighs 10 lbs. to the gallon, the percentage is arrived at. For instance, a kerosene tin of metal weighed 60 lbs. deducting the weight of the tin. When filled with water, it weighed 78 lbs. Consequently, the void space was represented by 18 lbs. of water, while the whole volume, 4 gallons, weighed 40 lbs. Thus, the percentage of void was found to be 45. A good mixture in this instance would be 6 parts of metal, 2 parts of sand, and 1 part of cement. In the example given, the metal was fairly large—about 2½ in. The percentage of void space increases as the size of metal or gravel diminishes, running from 35 to 45 in ordinary cases. For mixing concrete a smooth place or board is required. A mixing board may be made from the 6 x 1 hardwood provided for lining the roof. The sand, which must be dry, should be first put on the board, and then the cement added. The two should be thoroughly mixed and rolled out over the board in a thin layer, and the gravel or metal then spread on the top of the cement and sand. The whole may now be mixed dry, after which water should be added and shovelling continued until the whole mass is thoroughly moist, but not sufficiently so to make it run or become sloppy. The concrete should be used at once, and not allowed to stand even for half-an-hour. Any old concrete, as well as any finished off the previous day, should be well wetted and picked over to form a bond. In laying a foundation it is advisable to place a few rows of wire, barbed or plain, through concrete to reinforce it. Place four anchor bolts in trench as shown in Fig. 1 and fill in mould, and ram lightly. Excavations for anchor posts (three) should be 2 ft. x 2 ft. x 2 ft., and spaced 12 feet from foundation at equal distances. Three anchor bolts are also required. Fix anchor posts, fill in with concrete, and ram.

Scaffold.

Erect scaffold, keeping back 15 inches from the nearest point of foundation. Bolts and nuts are required for scaffolding. Thoroughly stay scaffold with 3 x 1 braces.

Walls.

Proceed to make doorways, as shown (Fig. 1), out of 4 x 1½ hardwood. When the frame has been made and squared, the first two staves should be bolted at the back of frame, the edge of staves being kept back 1½ inch from inside edge of door frame to form a rebate for doors to fit. Place the door frame in position on foundation. Plumb up and fasten to scaffold. Now proceed to place staves in position—first a 20-ft., then a 10-ft., and so on, and in this way break the joints. Where the staves butt together the ends should be scarfed for a depth of 2 inches. Use oregon lathes to hold staves temporarily until a section is erected, when the angle iron may be used to keep the silo in shape until the whole of the staves are erected on first section. Put on a couple of 5-8 bands, but

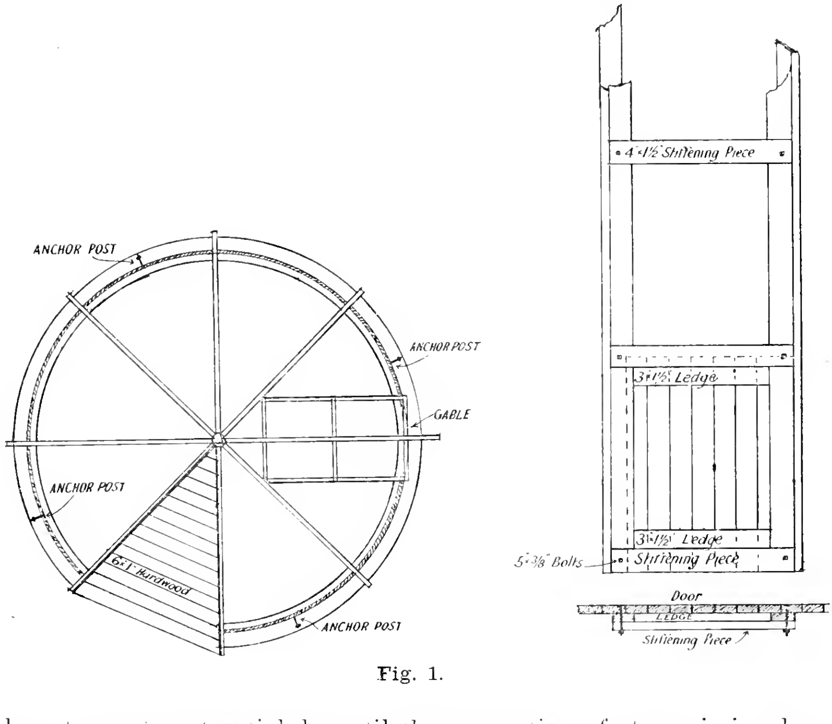
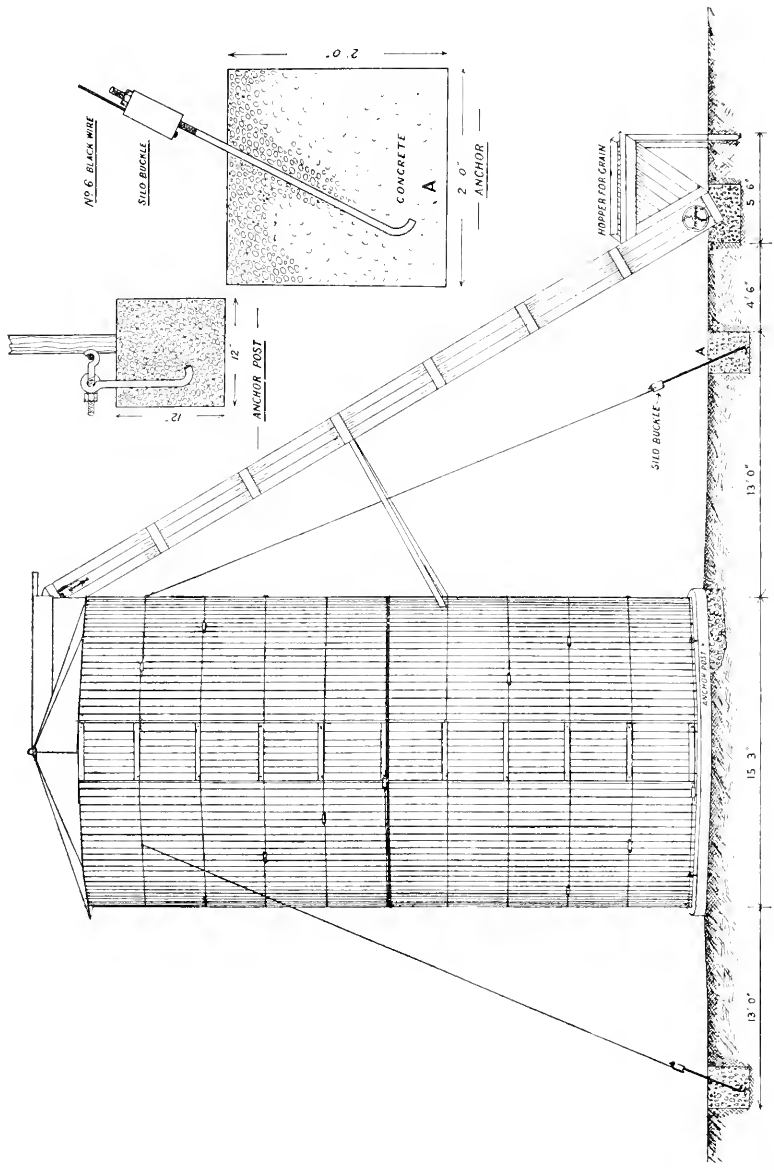


Fig. 1.

do not screw up too tightly until the top section of staves is in place. The joint of the band should be distributed over the silo, for if they be put in a direct line the strain will all come on one place, and soon pull the silo out of shape. Do not tighten all at one joint, but screw up a little at each until the whole silo is tight. Fix one set of angle iron with screws on outside of silo and midway between top and bottom, and the other on top inside edge of silo. Attach three guy wires to top hoop and to anchor posts previously set in concrete, and strain tight with couplings.

Roof.

An octagon roof is now made with a gable to allow of admittance of the elevator. The rafters are of 4 x 1½ hardwood, fastened on top end to



Nº 6 BLACK WIRE
SILO BUCKLE
2' 0"
CONCRETE
A
2' 0"
ANCHOR
12"
12"
ANCHOR POST
HOPPER FOR GRAIN
A
SILO BUCKLE
ANCHOR POST
5' 6"
4' 6"
13' 0"
15' 3"
13' 0"

Fig. 2.

a 6 x 6 hexagon finial, and well spiked to the silo at the bottom end, cover the whole of the roof with 6 x 1 hardwood, and on this cover with certainteed roofing fasten the roofing thoroughly.

Elevator.

The length of the elevator will vary with the local conditions, whether the ground is sloping, whether the cutter is mounted on a stage, and so

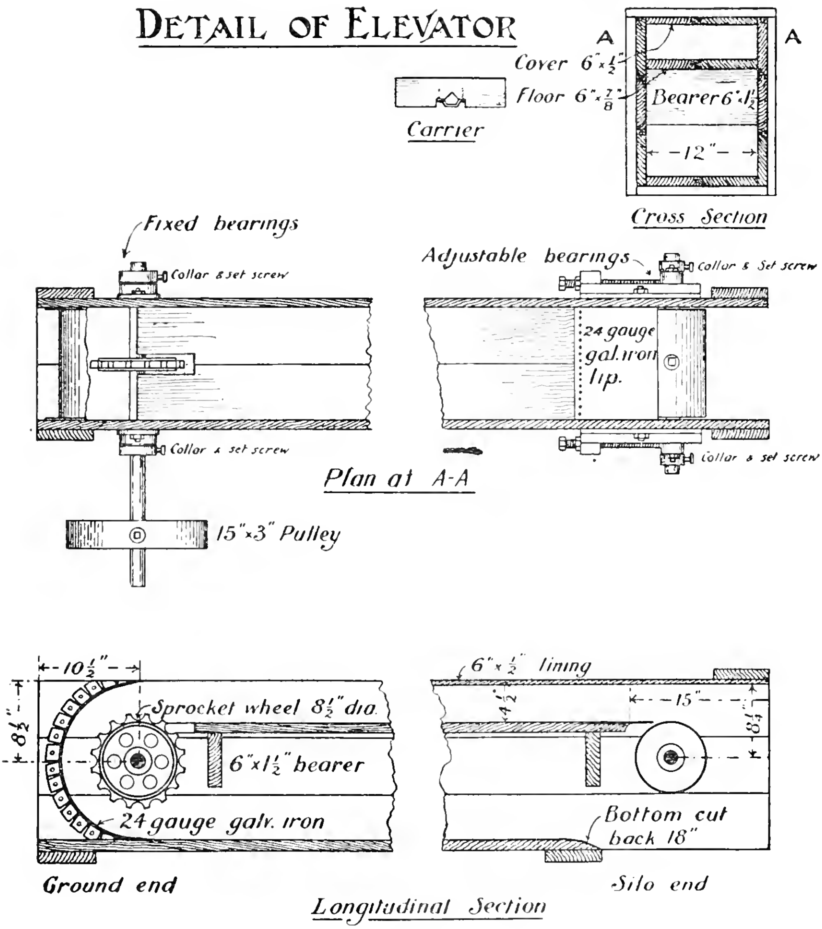


Fig. 3.

on. In general, the length necessary is about 30 feet. A box having sides made of three 6-in. x 1-in. tongued and grooved flooring boards with top and bottom floors of two similar boards, with a cover of 6-in. x ½-in. lining boards, is all that is required. This cover should be fixed in 6-ft. sections to allow of easy removal should it be necessary to get at the chain. The sides and bottom floor are secured by ledges of 6-in.

x 1-in. flooring about 4 ft. 6 in. apart. The upper floor is supported on 6-in. x 1½-in. oregon bearers spaced about 4 ft. 6 in. apart. The ground must be excavated to a sufficient depth under the chaff-cutter to allow the end of the elevator to come directly beneath the chaff-cutter, or the latter may be raised on a platform for this purpose, or both may be done as shown in drawing. The end of elevator being put in as far as possible below the chaff-cutter, a chute is made with pieces of sheet iron or of wood to connect the cutter, the whole being boxed in as far as practicable. It is essential that this chute should be as steep as possible to

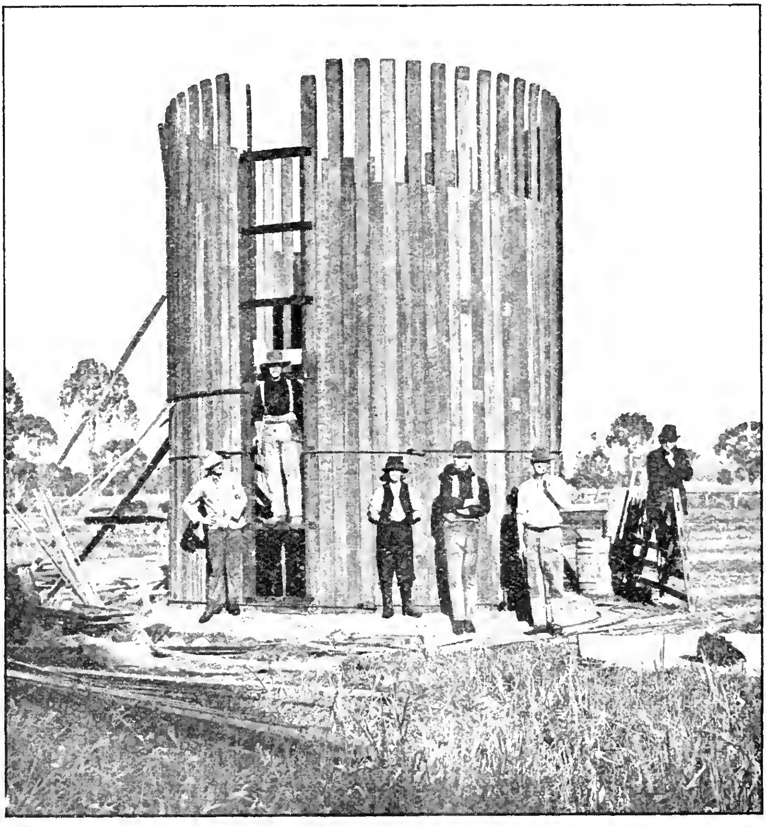


Fig. 4.—First Section of Silo. (Note each alternate joint is broken.)

prevent the silage from packing up. It is found better in practice to have the slats running up the top floor of elevator, and as the right-hand feed is desirable, which throws the cut stuff directly on to the elevator, a crossed belt (3 in. Balata) and pulley wheels 9-in. x 3-in. for the chaff-cutter spindle and 15-in. x 3-in. for the elevator spindle are used instead of the chain and sprocket wheels to drive the elevator. With the left-hand feed the stuff is thrown back against the chute, and very often causes trouble. If a chute is made by cutting the bottoms out of half-a-

dozen chaff bags, and then sewing them together, it can be tacked to the top end of elevator, and an even distribution of chaff will be obtained. One man holding the bottom of chute can walk round inside the silo and tramp the silage and distribute with the one operation. Without the chute all the heavy stuff will fall in one heap, and the flag will blow to the edges, which has been the main cause of waste on the outer edge

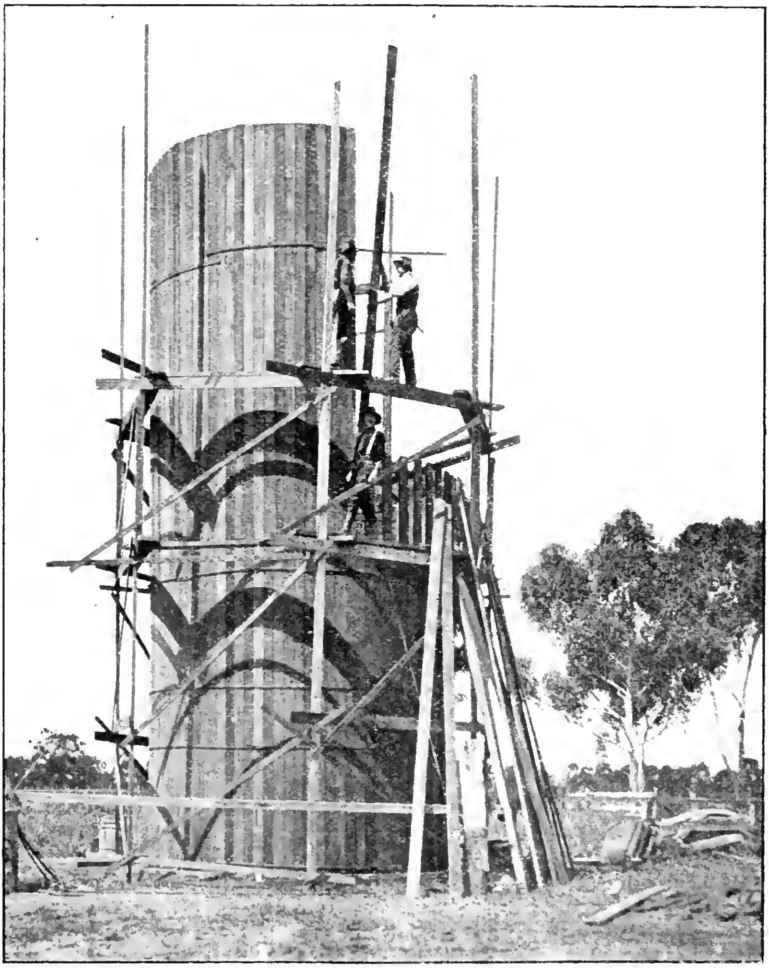


Fig. 5.—Erecting top section of Silo. (See laths for holding uprights till bands are placed in position.)

of silos. The ground end of elevator is rounded off with galvanized sheet-iron, allowing $\frac{1}{2}$-in. room for the slats to move round the sprocket wheel when the dead-eye bearings are fixed. The line of this iron will be described with a radius of $7\frac{3}{4}$ in. from the centre of the sprocket wheel. The cover of the elevator is left off about 5 feet from the

ground end of the elevator, to allow elevator to go under the chaff-cutter and tin chute to be fixed to same. Floors, sides, and ledges of elevator are made of 6-in. x $\frac{7}{8}$-in. T. and G. flooring. The lid is made of 6-in. x $\frac{1}{2}$-in. T. and G. lining. The bottom floor of elevator at the silo end is cut back 18 inches, and provided with a galvanized iron lip. This is to prevent the slats striking against the end of the bottom floor as they return to the bottom. The end of elevator is to project into the top of silo 21 inches. The top floor of elevator at the chaff-cutter end is cut back $11\frac{1}{2}$ inches from the end, and a slot $1\frac{1}{2}$ inches wide by 6 inches

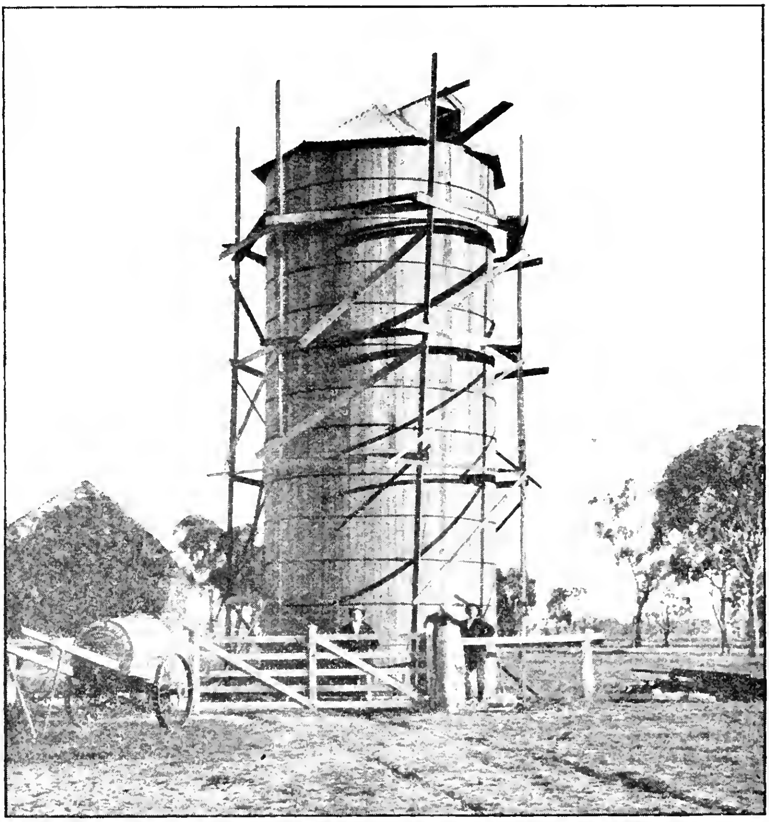


Fig. 6.—Completed Silo, showing method of Scaffolding.

long is cut in the centre of the floor, to allow the sprocket wheel and chain to work through. The adjustable bearings are attached to the outside of elevator at silo end with two $2\frac{1}{2}$-in. x $\frac{1}{2}$-in. bolts to each bearing, and a $\frac{3}{4}$-in. washer placed under the head of each bolt. The bearings are fixed so that the centre of spindle at the chaff-cutter end is $8\frac{3}{4}$ inches from the top edge of the elevator and at the silo end $8\frac{1}{4}$ inches from the top edge. A piece of galvanized iron 12 inches wide by 6 inches long is tacked to the top floor of elevator at the silo end. The

top edge of iron should just reach the pulley when the bearings are fully extended. Slot the iron out at the centre 1½ inches wide and 2 inches back at the end near pulley to enable chain to run through freely. A groove about ¼ inch deep should be cut in floor at the other end of the tin, to keep the end below the floor level and prevent the slats from catching the same. Four collars and set screws are provided for both spindles of elevator, to be fixed on spindles, on the outside of bearings, allowing ⅛-in. play between collars and bearings. The slats or buckets for carrying silage are 3-in. x 1-in. oregon, chamfered on one side, checked ¾ inch deep by 3¼ inch wide, for the attachments, which are fastened to the slats with two 2-in. No. 14 screws to each, with a V-shaped cut beneath the attachment, to allow for insertion of sprockets. The elevator is nailed together with 2-in. wire nails from inside; the nails well punched, clinched, and then punched again. Great care must be taken that nothing will project inside the elevator which may catch the slats. When running, do not let the chain of elevator get too slack, as very often this will cause a breakage. The elevator of a 100-ton silo is supported, as shown in drawing, with a T-piece (made of a length of the timber used as a scaffold), checked in half-an-inch at top end, and well spiked and fastened to the silo, as shown. Iron buckets are supplied instead of wooden slats, for elevating the grain.

Material 100-ton All-wood Silo.

Hardwood, 4-in. x 1½-in., T. & G.; 142 20-ft.

Hardwood, 4-in. x 1½-in., T. & G.; 142 10-ft.

Iron, round, ⅝-in.; 48 12-ft.

Silo buckles, 42.

Anchor posts, 3 3-ft. x ⅝-in.

Anchor posts, 4 12-in. x 1⅛-in., with eye and tightening bolts.

Bolts and nuts, 30 5-in. x ⅜-in.

Nuts, ⅝-in., 90.

Angle iron, 8 12-ft., bent to circle.

Hardwood, 4-in. x 1½-in.; 12 10-ft., 3 12-ft.

Hardwood, 3-in. x 1½-in.; 5 12-ft., 4 16-ft., 6 10-ft.

Hardwood, 6-in. x 1-in.; 400 run.

Certainteed, 1 roll.

Cement, 4 casks.

1 bundle laths.

3 yards screenings, broken metal, or clean gravel.

2 yards sand.

Nails, 10 lbs. 3-in.; 2 lbs. 1⅛-in.

⅝-in. staples, 3 lbs.

In constructing the all-wood stave silo only the best of timber, free from knots, shakes, and gum veins, and guaranteed to be thoroughly seasoned by the kiln process, should be used.

If desired, the Department of Agriculture will arrange for the building of silos in any part of the State. Full particulars of charges will be furnished on application to the Director of Agriculture.

STANDARDIZED PACKING AND GRADING OF FRUIT.

By Ernest Meeking, Senior Fruit Inspector.

Part I.

Introductory.

The ever increasing demands of modern civilization for improved food, clothing, housing, lighting, transportation, sanitation, and other material benefits have brought the adoption of standardized methods of production and manufacture to the fore. Even in such matters as public education and hygiene, the ever-widening application of these has compelled for their governance the adoption of certain fixed standards or laws. As a result, such phrases as "standard of living," "standard of education," &c., as applied to communities or nations, and "standards of purity," "standard of quality," &c., as applied to goods which communities or nations manufacture or produce, have now become commonplace expressions of the public press and platform.

Two considerations or motives lie at the back of this movement towards standardization, the first based on utilitarian, and the second on what may be termed ethical lines. Experience has shown that the surest way to build up a permanent trade in any given article is to turn out that article as nearly as possible in conformity with a standard grade. This results in establishing a basis of value for the guidance of both the seller and purchaser. For instance, to quote a few well-known examples, all our most widely used brands of soaps, petroleum oils, cornflours, biscuits, motor cars, sporting guns, rifles, agricultural implements, tools, optical and scientific instruments, spraying materials, drugs, and many other articles too numerous to mention, have, by reason of their uniform standard of quality, established a world-wide reputation, and a consequent leading position in all markets. This exemplifies the truth of the old adage that honesty is the best policy.

But the practice of standardization has even a more deep-seated and, perhaps, more important effect than merely enhancing or facilitating the sale of goods to which it is applied. It has a character-building effect, inasmuch as it engenders a feeling of respect and trust on the part of the consumer towards the producer or manufacturer of the goods, and a feeling of pride or self-respect on the part of the producer or manufacturer, who realizes that the standard of his goods is accepted as a reflex of the standard of his character—a reputation he is naturally determined to maintain by keeping the goods at high-water mark.

In addition to the foregoing, standardization also makes for efficiency and economy in production, and gives the best results with a minimum of waste in time, effort, and material. This is more clearly exemplified in connexion with war activities than in the competition of modern trade under peaceful conditions, no matter how strenuous that competition may be. In time of war, this competition is intensified a thousandfold, as it is not a question of the survival of an individual business, but one on whose issue the fate of nations hangs. Any weakness in organization or efficiency may prove fatal. This gives added significance to the fact that the principle of standardization is far more widely and rigidly applied in war than in any other human activity. Guns, munitions, equipment, &c., are all made to standard patterns, and even methods of

attack and defence are subject to certain fixed or standard rules which experience has proved to be the most efficient.

It does not require a stretch of imagination to realize the chaos which would exist, and the loss of time, material, and energy which would result if the guns, ammunition, and other equipment of a modern army were not turned out to standard patterns. The value of standardization in the direction of producing a maximum of result in a given period has been fully emphasized by the present needs of the Allies for maintaining the wastage in shipping tonnage caused by the submarine campaign of our enemies. This has resulted in the building of ships to standard patterns, as it has been found that therein lies the only hope by which the menace may be effectively met.

At first sight the pertinence of the foregoing remarks to the subject-matter of this article may not seem apparent, but the comparisons have been drawn to emphasize the utility of the principle of standardization as applied to a wide range of industry. It has been found that wherever it has been adopted it begets (*a*) efficiency; (*b*) economy in effort, time, and material; and (*c*) confidence between the manufacturer or producer and the seller and purchaser of goods.

The experience gained since the adoption of standardized methods of grading and packing fruit in the United States and Canada, the two largest fruit-growing countries in the world, has shown that these methods are a *sine qua non* for building up a large fruit industry on successful lines. A perusal of the Proceedings of the 50th Californian and State Fruit Growers Convention, held at Sacramento, 21st to 23rd November, 1917, shows that all the delegates who delivered addresses on this subject paid high tributes to the beneficial results which had accrued to the fruit industry in California and other parts of America by the adoption of standardized packing and grading. Not a single dissentient voice was raised against the principle generally, nor against the operation of the Fresh Fruit Standardization Law, which was passed in 1915 to give legal effect to the standard packs which had already been voluntarily adopted for many years by most of the co-operative and other fruit-growing and fruit-distributing concerns of California.

Space will not permit a reprint of all the statements in full which were made by the various speakers at the Convention, but a few extracts will suffice to show how standardized packing is viewed in California.

Mr. F. B. McKevitt, President, California Fruit Distributors:—

> "Standardization, while it is new in a legal sense, is not a new thing by any means. Standardization has been practised by the Californian growers since they began to send their fruit to the East—not all, but all those who have made the greatest success. In order to make a demand for fruit it is necessary to have good fruit, and standardization means nothing more or less than the packing of good fruit. It seems to me that standardization is simply a synonym for common honesty. . . . Standardization is nothing more or less than the selfish proposition of giving the grower more money for his fruit, as well as giving to the consumer more fruit for his money. Therefore it is a splendid thing all along the line."

Mr. E. O. McCormick, vice-president, Southern Pacific Railway Company:—

> "It is the pack that sells, whether it is the inner seal, the habisco wafer, or the American cracker, or the tobacco pouch, or the orange or lemon with the brand which we have made known, or your wonderful grapes, or the way you pack your cherries. It is the honest pack to-day that sells."

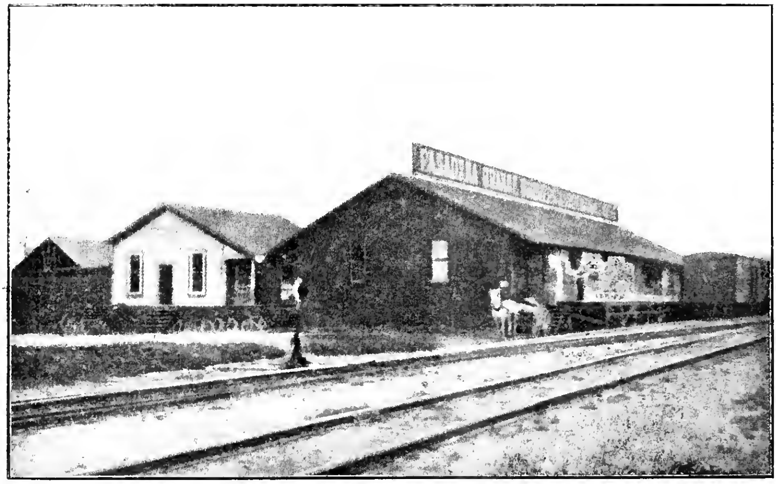
Alder Anders, in Sacramento:—

> "I have heard the addresses, and so far I have not heard a false note. Everybody is for standardization, and it is as well as a progressive business people that the fruit-growers should be so, for standardization is nothing but a matter of evolution in the matter of handling Californian fruits."

A. P. Anewalt, general freight agent, Sante Fe railway, Los Angeles:—

> "This is an age of efficiency, which is another word for standardization, and uniformity in complying with it; without uniformity of performance, standardization, whatever may be its merit, will accomplish little good."

Many other members of the Convention spoke in a similar strain, some especially instancing the way in which the fruit industry in California had benefited by standardized packing. The benefits which have accrued to the fruit industry in America by standardization have been alluded to in past numbers of this *Journal*, more particularly in connexion with the establishment and development of the Californian Citrus Fruit-growers Exchange, and the North-western Fruit Exchange. These

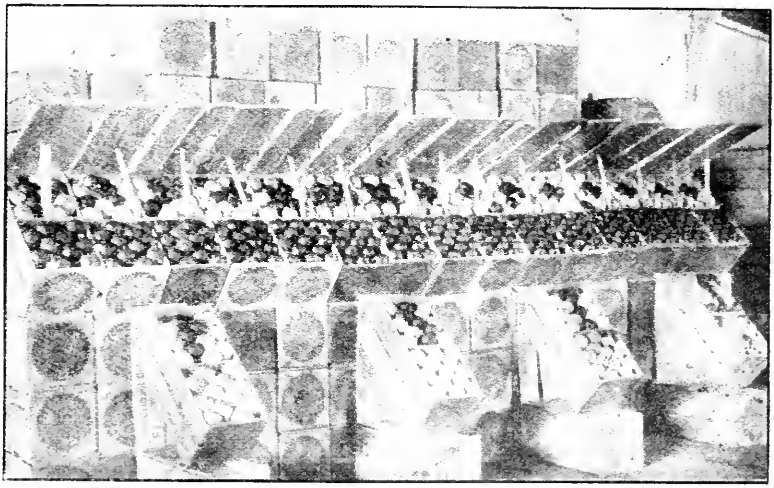


Orange Packing House, Pasadena, California. (Reprinted from "Co-operation in Agriculture.")

two co-operative exchanges, which are now the largest handlers and distributors in the world of citrus and deciduous fruits respectively, rose from small beginnings, and under the most adverse circumstances. Their success has been almost solely due to the standardization of their packs, and the reputation for honest grading and packing which they have thereby established in every market where their fruits have been placed. The frequent allusions in this *Journal* to the success which has been achieved in the United States and Canada by the adoption of standardization packing has been met by certain sections of our fruit-growers by the statement that the conditions in existence on the North American Continent were so different from those which obtained in Australia as to raise grave doubts as to their applicability here. An endeavour will be made later to show that not only is it possible to apply the same methods in Victoria, but that the application of these methods would probably result in benefit to the producer, seller, and consumer of our fruits.

Before giving reasons for this belief, it may be as well to point out some of the changes in the present methods of marketing and distributing our fruits which will be necessary to establish standardized packing and grading on proper lines, and to give the fullest effect to the system. This will lead to a consideration of the defects which exist under our present methods, and the reasons for the introduction of the legislation which has been enacted for the purpose of remedying or at least mitigating these defects.

The system at present in vogue in Victoria under which our fruits are prepared for market, and whereby they are distributed to the consuming public, is practically the same as that which existed thirty years or more ago, when the average acreage did not amount to more than 25 per cent. of the production of to-day. At the beginning of that period, none of the large fruit-producing centres in the irrigation areas north of the Dividing Range had been established. The large fruit-growing centres since opened up in the Diamond Creek, Bendigo, Bacchus



Oranges exposed for sale at auction, New York. (Reprinted from "Co-operation in Agriculture.")

Marsh, Ovens Valley, Portland, Pakenham, Stawell, Somerville, and Timboon districts did not exist. In addition, many large individual orchards all over the State had not come into being. Even in the older fruit-growing districts, the area which has been planted during the period under notice has more than doubled. The growth of the local consuming public in the same period has not increased in proportion to the rate of production, as the population of the State from 1887 until 1917 has increased only 55 per cent. In spite of this huge increase in production, the facilities for distribution of fruit have not been increased; in fact, it is most probable that they have relatively decreased. The disappearance of the fruit-hawker from the streets of Melbourne and suburbs will be noticed by those of us old enough to carry our memories back some two or three decades.

It is thought by many that the passing of the fruit hawker is mainly due to the harshness of our municipal laws in the metropolitan area

against this class of trader, and the difficulty which exists under those laws to obtain the necessary licence. This, however, is not the chief reason. The hawker has disappeared mainly because he has become taboo to the consumer. This taboo has arisen through the inability of the consumer to obtain an honest deal. Too often the housewife has found, after examining a half-case or case of fruit purchased from the hawker at the door, that the purchase consisted of a mixture of specimens differing in variety, size, and degree of maturity, and often, in addition, contains a proportion of unsound fruits. The confidence of the consumer has thus become forfeited, the business of the hawker has automatically ceased, and closed the largest and most direct channel whereby the consumer may be reached.

The place of the hawker in the metropolitan area has, to some extent, been taken by the retail fruiterer, and by the increased number of stall-holders in the Queen Victoria and other retail markets. It is obvious that neither of these provide an efficient method for reaching a large proportion of the public, which has not yet learned the food value of fruit, and the necessity for its inclusion in the daily dietary. They are fond of fruit, however, and have some realization of its hygienic value, but not to such an extent as would induce them to go to the trouble of attending the market or paying a visit to the retail fruit shop in their locality. Such visits, too, cannot in many instances be made with any degree of frequency without a fair amount of personal inconvenience. Moreover, the dishonest practices which have caused the consumer to taboo the hawker are largely in operation in the markets and retail shops. The disgust of the purchaser is intensified by carrying home a parcel of fruit to find that perhaps half his purchase consists of unusable specimens.

(To be continued.)

LECTURES, FARMERS' CLASSES, ETC.

The following letter has been addressed to the secretaries of agricultural societies throughout the State by the Director of Agriculture:—

I have the honour, by direction, to inform you that the Department's arrangements for the holding of stallion parades, lectures, and farmers' classes during 1918 are as under:—

Stallion Parades.

A somewhat curtailed time-table for stallion parades is being arranged, and will be forwarded to you shortly, so that the necessary local arrangements may be made as usual. It is desired that the system confining the award of prizes to certified stallions only shall be continued, in order that societies may obtain the benefit of the subsidy when Government grants to agricultural societies are resumed.

Lectures.

Enclosed is a list of lectures and demonstrations which will be given on request from agricultural societies and kindred bodies during 1918.

On account of the shortage in the staff, through enlistment, no lectures on veterinary subjects can be given, but the whole programme on other subjects can be arranged, and the Department will be glad to comply with the requests of societies as far as possible.

It is suggested, in order to save the time of officers and travelling expenses, that societies requiring the usual four lectures should arrange that, at least, two should be held at centres in the same district on two following dates, or as near one another as practicable.

Farmers' Classes.

The period for farmers' classes will be the same as for last year, namely, a week.

Applications should reach me as early as possible.

DEPARTMENT OF AGRICULTURE, VICTORIA.

Lectures and Classes for 1918.

The object of the Agricultural Department in offering lectures or classes, free of charge, to farmers and land-owners is to enable them to obtain information on up-to-date farming methods, and the results of the research and experimental work on the research farms in Victoria.

The Agricultural Department recognises the fact that agricultural societies and progress associations can assist largely in organizing meetings for these purposes, and for the benefit of the agricultural community generally.

A competent staff of lecturers is available from both the practical and scientific aspects of the subjects to be dealt with. A list of subjects and the staff employed for lecturing is submitted herewith.

The benefits to be derived are:—

Agriculture.

A knowledge of our different crop requirements, and how to supply them for the greatest profit.

The best systems of cultivation.

The right kinds of manures and quantities to use for various crops and soils.

The saving of money in the purchase of manures.

Systems of farm management.

Main points in successful wheat culture.

Dairying.

How to breed and manage dairy cows.

The building of sheds, silos, &c.

Methods of testing cream and milk.

Foods to feed for maximum results.

The management of pigs, breeding and feeding.

Cheese-making.

Apiculture.

How to handle and manage bees.

Treatment of their diseases and methods of control.

Poultry.

The best methods of breeding, selecting, rearing, and managing fowls for table use or egg production.

How to feed for highest profit.

The treatment of common ailments.

Orchard and Viticulture.

The main points in making these industries successful.

Stallion Parades.

The awards of prizes in all classes for stallions three years old and over at the society's show to be subject to the possession by the exhibit of a Government certificate of soundness.

Stallion inspection parades will be held at different centres throughout the State prior to the commencement of the show season. (Time-table for stallion parades for 1918 will be available shortly after 1st May, 1918.) The parade centres are so arranged that all owners of show stallions have the opportunity of submitting them for examination for the Government certificate of soundness before the closing of entries for the show. Show secretaries will require to obtain evidence of the possession of the Government certificate in respect of exhibits at the time of entry, and should not accept entries of other than certificated horses.

Immediately after the show, secretaries of societies are required to forward the names of *all the horses* that have won the prizes in stallion classes, together with the names of the owners, to the Director of Agriculture.

Farmers' Classes.

Applications should be submitted as early as possible.

Twenty students at least must be enrolled before a class can be held.

The rent of hall and all local charges are to be paid by the society; all other expenses by the Department. Arrangements must be made to insure the uninterrupted use of the hall during the time the lectures are going on.

A roll of attendances at lectures and demonstrations shall be kept.

The agricultural classes will extend over one week, consisting of not more than five evening lectures. Field demonstrations will be arranged for day-time instruction on days as required. The majority of the lectures will be illustrated by limelight views.

Examinations will be held at the conclusion of each class, provided not less than five students compete. The successful competitor at each class will be eligible to take part in a final examination for the A.N.A. gold medal in Melbourne.

Free rail tickets will be issued to students to attend this final examination. Five competitors or more must attend, or no medal will be awarded.

Professional men, students in attendance at Agricultural High Schools and Colleges, or at the Continuation Schools, and teachers from such institutions or State-schools, are not allowed to sit for the examination.

Lectures.

Applications should be submitted as early as possible, and accompanying the application must be a list of the subjects (see page 3) which the society chooses. The dates of lectures or classes will then be fixed by the Department, and if societies will state the most suitable seasons for their districts, the classes or lectures will, as far as possible, be arranged accordingly.

The president or secretary, or a member of the council or committee of the society must take the chair at each lecture or class, and must certify as to the number and *boná fides* of the attendance.

The rent of the hall, advertising, and all other local charges are to be paid by the society—all other expenses by the Department.

SYNOPSIS OF LECTURES AND DEMONSTRATIONS.

Principles of Agriculture.

1. The plant food of the soil.
2. Cultivation methods and management.
3. Principles of manuring.
4. Valuation of artificial manures.
5. The management of the farm.
6. Special crops and catch crops.
7. Irrigation principles and methods.
8. Factors in successful wheat cultivation.
9. Result of experimental work.

Dairy Farming.

1. Breeding and management.
2. Dairy buildings—silos and silage.
3. Dairy management.
4. Milk and cream testing.
5. Foods and feeding.
6. Pig breeding, feeding, and management.
7. Cheese-making.

Apiculture.

1. The honey industry—handling bees.
2. Breeding and management.
3. Diseases of bees—methods of control.

Poultry Breeding and Management.

1. Incubation—natural and artificial—the rearing of chickens.
2. Breeds—payable or otherwise, table and export; eggs, how to select stock.
3. Turkeys—their care and management. Duck raising and care.
4. Foods and feeding, with practical demonstration—mixing the mash.
5. Common ailments of poultry.

Orchard and Garden Work.

1. Fruit-growing—varieties suitable to the different localities, soils, and sites.
2. Preparation of land—planting and pruning.
3. Cultivation—manuring and management.
4. Insect pests and fungus diseases and their treatment.

The Fruit Industry.

1. Handling, packing, grading, and marketing of fruit for export and local trade.

Viticulture.

1. Establishment of vineyard.
2. Phylloxera and resistant stocks—preparation of land.
3. Propagation and grafting—best varieties to grow.
4. Pruning and seasonable operations.
5. Wine making and cellar management.
6. Drying raisins, sultanas, and currants—fresh grapes for export.
7. Vine diseases and treatment.

SUBJECTS AND STAFF.

Principles of Agriculture—Mr. A. E. V. Richardson, M.A., B.Sc., and Mr. H. A. Mullett, B.Ag.Sc.

Dairy Farming—Mr. R. T. Archer and staff of dairy supervisors.

The Dairying Industry and Export Trade—Mr. R. Crowe.

Orchard and Garden Work—Messrs. P. J. Carmody, H. W. Davey, and E. E. Pescott.

Viticulture—Mr. F. de Castella.

Flax Culture and Demonstrations at Shows—Mr. J. E. Robilliard.

Poultry Breeding and Management—Mr. A. V. D. Rintoul.

Poultry Dressing Demonstrations—Mr. A. Hart.

Potato Culture—Mr. J. T. Ramsay.

Pig Breeding and Management—Mr. R. T. Archer.

Fruit Industries—Mr. E. Meeking.

Insect Pests—Mr. C. French.

Plant Diseases—Mr. W. Laidlaw, B.Sc., and Mr. C. C. Brittlebank.

Apiculture—Mr. F. R. Beuhne.

Cheese Industry—Mr. G. C. Sawers.

STALLION PARADES.

TIME TABLE, 1918.

(Subject to alteration at short notice.)

Date.	Place.	Time.	Officer Arrives.	Officer Departs.
SPECIAL.				
Every Saturday :— June 22 to Dec. 21 ..	Agricultural Offices	10 a.m. to 12 noon		
July 22 to July 24 ..	Royal Show Grounds	10 a.m.		
WIMMERA No. 1.				
Monday, July 8 ..	Ararat ..	3 p.m. ..	1.27 p.m. ..	9.25 p.m.
Tuesday, July 9 ..	Goroke ..	3 p.m. ..	2 p.m. ..	6 p.m.
Wednesday, July 10..	Horsham ..	9 a.m. ..	9.25 p.m. (9th) ..	12.10 p.m. (11th)
Thursday, July 11 ..	Stawell ..	3 p.m. ..	2.41 p.m. ..	7.46 p.m.
WESTERN No. 1.				
Tuesday, July 16 ..	Coleraine ..	10 a.m. ..	7.35 p.m. (15th)	Driving
Tuesday, July 16 ..	Casterton ..	3 p.m. ..	Driving ..	8.30 a.m. (17th)
Wednesday, July 17..	Portland ..	1.5 p.m. ..	1.5 p.m. ..	2.55 p.m.
Thursday, July 18 ..	Hamilton ..	11 a.m. ..	6.8 p.m. (17th)..	Driving
Thursday, July 18 ..	Balmoral ..	3 p.m. ..	Driving ..	Driving

Stallion Parades, Time Table—*continued.*

Date.	Place.	Time.	Officer Arrives.	Officer Departs
CENTRAL No. 1.				
Wednesday, July 21	Inglewood ..	2 p.m. ..	1.30 p.m. ..	4.25 p.m.
Thursday, July 25 ..	Bendigo ..	11 a.m. ..	6 p.m. (24th) ..	3.15 p.m.
MALLEE No. 1.				
Monday, July 29 ..	St. Arnaud ..	3.30 p.m.	3.22 p.m. ..	12.12 a.m. (30th)
Tuesday, July 30 ..	Donald ..	10 a.m. ..	1.22 a.m. ..	Driving
Tuesday, July 30 ..	Watchem ..	1.30 p.m ..	Driving ..	Driving
Tuesday, July 30 ..	Birchip ..	3 p.m. ..	Driving ..	8.40 p.m.
Wednesday, July 31 ..	Mildura ..	3 p.m. ..	7.10 a.m. ..	6 p.m.
Thursday, August 1 ..	Ouyen ..	3 p.m. ..	9.45 p.m. (31st)	9.45 p.m.
NORTH-EASTERN No. 1.				
Monday, July 29 ..	Rutherglen	2 p.m. ..	1.53 p.m. ..	3.22 p.m.
Tuesday, July 30 ..	Yarrawonga	11 a.m. ..	10.5 p.m. (29th)	2.45 p.m.
Tuesday, July 30 ..	Tungamah	3.30 p.m.	3.26 p.m. ..	8.6 a.m. (31st)
Wednesday, July 31 ..	Myrtleford ..	3 p.m. ..	2.59 p.m. ..	7 22 a.m. (1st)
Thursday, August 1 ..	Benalla ..	2 p.m. ..	10.17 a.m. ..	5.40 p.m.
Friday, August 2 ..	Euroa ..	10 a.m. ..	6.33 p.m. (1st)	11.12 a.m.
WIMMERA No. 2.				
Tuesday, August 6 ..	Hopetoun ..	3 p.m. ..	9.35 p.m. (5th)	7 a m. (7th)
Wednesday, August 7	Warracknabeal	3 p.m. ..	9.50 a.m. (6th)	7.50 p.m.
Thursday, August 8 ..	Beulah ..	10 a.m. ..	9.15 p.m. (7th)	11.55 a.m.
Thursday, August 8 ..	Minyip ..	3.30 p.m. ..	3.18 p.m. ..	11.43 a.m. (9th)
Friday, August 9 ..	Murtoa ..	2 p.m. ..	12.30 p.m. ..	3.32 p.m.
MALLEE No. 2.				
Tuesday, August 26 ..	Swan Hill ..	3 p.m. ..	6.25 p.m. (5th)	10.50 a.m. (7th)
Wednesday, August 27	Kerang ..	3 p.m. ..	1.9 p.m. ..	6 a.m. (8th)
Thursday, August 28	Pyramid ..	11 a.m. ..	7.10 a.m. ..	Driving
Thursday, August 28	Cohuna ..	3 p.m. ..	Driving ..	12.30 p.m. (9th)
Friday, August 29 ..	Elmore	4.15 p.m.	4.15 p.m. ..	4.55 p.m.
Saturday, August 30	Frankston ..	3 p.m. ..	2.31 p.m. ..	5.6 p.m
WIMMERA No. 3.				
Monday, August 12 ..	Beaufort ..	2 p.m. ..	12 27 p.m. ..	8.20 p.m.
Tuesday, August 13 ..	Kaniva ..	2 p.m. ..	2.28 a.m. ..	12.42 a.m. (14th)
Wednesday, August 14	Nhill ..	3 p.m. ..	1.22 a.m. ..	1.32 a.m. (15th)
Thursday, August 15	Rainbow ..	12 noon ..	11.55 a.m. ..	2.50 p.m.
Thursday, August 15	Jeparit ..	4 p.m. ..	4 p.m. ..	8.25 a.m. (16th)
Friday, August 16 ..	Dimboola ..	11 a.m. ..	10 a.m. ..	2.18 p.m. (16th)

STALLION PARADES, TIME TABLE—*continued.*

Date.	Place.	Time.	Officer Arrives.	Officer Departs.
GOULBURN VALLEY No. 1.				
Monday, August 12 ..	Rochester ..	2 p.m. ..	1.36 p.m. ..	10.14 p.m.
Tuesday, August 13 ..	Echuca ..	11 a.m. ..	10.55 p.m. (12th)	3 p.m.
Wednesday, August 14	Tatura ..	10 a.m. ..	5.41 p.m. (13th)	11.44 a.m.
Wednesday, August 14	Kyabram ..	2 p.m. ..	12.52 p.m. ..	4.25 p.m.
Thursday, August 15	Seymour ..	2 p.m. ..	8.16 p.m. (14th)	8 33 p.m.
Thursday, August 15	Geelong ..	3 p.m. ..	12.50 p.m. ..	5.55 p.m.
Friday, August 16 ..	Heathcote ..	2 p.m. ..	11.41 a.m. ..	6.59 p.m.
MALLEE No. 3.				
Tuesday, August 20 ..	Quambatook	10 a.m. ..	6.33 p.m. (19th)	11.31 a.m.
Tuesday, August 20 ..	Boort ..	12 55 p.m.	12.55 p.m. ..	1.35 p.m.
Wednesday, August 21	Charlton ..	2 p.m. ..	4.7 p.m. (20th)..	4.27 p.m.
Thursday, August 22	Sea Lake ..	3 p.m. ..	9.25 p.m. (21st)	8 30 a.m. (23rd)
Friday, August 23 ..	Wycheproof	11.50 a.m.	11.50 a.m. ..	12.40 p.m.
NORTH-EASTERN No. 2.				
Monday, August 19 ..	Tallangatta	4.40 p.m.	4.38 p.m. ..	5 a.m. (20th)
Tuesday, August 20 ..	Corryong ..	3.30 p.m.	3.30 p.m. ..	7 a.m. (21st)
Thursday, August 22	Wangaratta	2 p.m. ..	9.34 a.m. ..	4.30 p.m.
NORTH-EASTERN No. 3.				
Monday, August 12 ..	Dookie ..	2 p.m. ..	12.45 p.m. ..	4.10 p.m.
Tuesday, August 13 ..	Cobram ..	2 p.m. ..	1.57 p.m. ..	3.10 p.m.
Wednesday, August 14	Numurkah ..	11 a.m. ..	4.38 p.m. (27th)	12.55 p.m.
Wednesday, August 14	Nathalia ..	2 p.m. ..	1.47 p.m. ..	3 31 p.m.
Thursday, August 15	Shepparton..	2 p.m. ..	5.40 p.m. (28th)	6 p.m.
Friday, August 16 ..	Murchison ..	9.30 a.m.	7.15 p.m. (29th)	10 58 a.m.
Friday, August 16 ..	Rushworth	2 p.m. ..	11.48 p.m. ..	5.20 p.m.
CENTRAL No. 2.				
Monday, August 26 ..	Mansfield ..	2 p.m. ..	2 p.m. ..	3.30 p.m.
Tuesday, August 27 ..	Yea ..	9.30 a.m ..	6.33 p.m. (26th)	10 33 a.m.
Tuesday, August 27 ..	Alexandra ..	2 p.m. ..	12.25 p.m. ..	4.40 p.m.
Wednesday, August 28	Kilmore ..	10 a.m. ..	10 p.m. (27th) ..	9 45 p.m.
Thursday, August 29	Ballan ..	10 a.m. ..	10 a.m. ..	12.2 p.m.
Thursday, August 29	Melton ..	2 p.m. ..	1.31 p.m. ..	5.13 p.m.
Friday, August 30 ..	Bacchus Marsh	11 a.m. ..	5.31 p.m. (29th)	12 59 p.m.
Saturday, August 31..	Werribee ..	12 noon ..	11.47 a.m. ..	1.16 p.m.
WESTERN No. 2.				
Monday, Sept. 2 ..	Colac ..	3 p.m. ..	10.41 a.m. ..	8.20 p.m.
Tuesday, Sept. 3 ..	Camperdown	11 a.m. ..	9.36 p.m. (2nd)..	12.14 p.m.
Tuesday, Sept. 3 ..	Terang ..	3 p.m. ..	12.44 p.m. ..	10 27 p.m.
Wednesday, Sept. 4 ..	Warrnambool	11 a.m. ..	11.32 p.m. (3rd)	2.17 p.m.
Wednesday, Sept. 4 ..	Koroit ..	3 p.m. ..	2.45 p.m. ..	12.22 a m. (5th)
Thursday, Sept. 5 ..	Port Fairy ..	11 a.m. ..	12.52 a.m. ..	1.27 p.m.
Thursday, Sept. 5 ..	Penshurst ..	4 p.m. ..	Driving ..	7.47 a.m. (6th)

STALLION PARADES, TIME TABLE—*continued.*

Date.	Place.	Time.	Officer Arrives.	Officer Departs.
CENTRAL No. 3.				
Monday, Sept. 2 ..	Castlemaine	10 a.m. ..	9.30 a.m. ..	12.25 p.m.
Monday, Sept. 2 ..	Kyneton ..	1.30 p.m...	1.11 p.m. ..	3.12 p.m.
Tuesday, Sept. 3 ..	Maryborough	11 a.m. ..	5 58 p.m. (2nd)	12 55 p m.
Tuesday, Sept. 3 ..	Clunes ..	2 p.m. ..	1.43 p.m. ..	7.36 p.m.
Wednesday, Sept. 4 ..	Smeaton ..	2 p.m. ..	Driving ..	Driving
Thursday, Sept. 5 ..	Daylesford ..	2 p m. ..	7.17 p.m. (4th)	3.25 p.m.
Friday, Sept. 6 ..	Ballarat ..	2 p.m. ..	6 36 p.m. (5th)..	7.10 p.m.
GIPPSLAND No. 1.				
Monday, Sept. 9 ..	Bunyip ..	10 a.m. ..	9 56 a.m. ..	6 31 p.m.
Tuesday, Sept. 10 ..	Morwell ..	10 a.m. ..	8.49 p.m. (9th) .	12.15 p m.
Tuesday, Sept. 10 ..	Mirboo ..	2 p.m. ..	1.50 p.m. ..	4.15 p.m.
Wednesday, Sept. 11	Traralgon ..	11 a.m. ..	9.15 p.m. (10th)	12 20 p m.
Wednesday, Sept. 11	Sale ..	2 p.m. ..	1.26 p.m. ..	4.11 p.m.
Thursday, Sept. 12 ..	Trafalgar ..	11 a.m. ..	6 51 p.m. (11th)	2.8 p m.
Thursday, Sept. 12 ..	Warragul ..	3 p.m. ..	2 50 p.m. ..	7 50 p m.
Friday, Sept. 13 ..	Dandenong	11 a.m. ..	9.32 p.m. (12th)	1.38 p.m.
GIPPSLAND No. 2.				
Monday, Sept. 9 ..	Lang Lang ..	2 p.m. ..	8.55 a.m. ..	7.17 p.m.
Tuesday, Sept. 10 ..	Dalyston ..	2 p.m. ..	9.4 p.m. (9th) ..	3.57 p.m.
Wednesday, Sept. 11	Leongatha ..	9.30 a.m.	9.7 p.m. (10th)..	10 59 a.m.
Wednesday, Sept. 11	Foster ..	2 p.m. ..	12.30 p.m. ..	8.55 p.m.
Thursday, Sept. 12 ..	Yarram ..	9.30 a.m ..	11 p.m. (11th) ..	10.30 a.m.
Friday, Sept. 13 ..	Korumburra	3 p.m. ..	4.45 p.m. (12th)	5.5 p.m.
GIPPSLAND No. 3.				
Monday, Sept. 16 ..	Romsey ..	11 a.m. ..	10.41 a.m. ..	5.25 p.m.
Wednesday, Sept. 18	Orbost ..	2 p.m. ..	8.50 p.m. (17th)	6.40 a.m. (19th)
Thursday, Sept. 19 ..	Bairnsdale ..	12 noon ..	11.30 a.m. ..	2.25 p.m.
Friday, Sept. 20 ..	Lilydale ..	3 p.m. ..	1.45 p.m. ..	5.35 p.m.
GIPPSLAND No. 4.				
Tuesday, Sept. 17 ..	Omeo ..	3.30 p.m.	2.30 p.m. ..	6.30 a.m. (18th)
Friday, Sept. 20 ..	Mernda ..	12.30 p.m.	12.24 a.m. ..	1.15 p.m.
Monday, Sept 23 ..	Royal Show	9 a.m.		

PLANTING AND RECONSTITUTION OF VINEYARDS.

Conditions Governing the Distribution of Phylloxera-Resistant Vine Rootlings and Cuttings.

The conditions subject to which Victorian vine-growers may purchase phylloxera-resistant vine cuttings and rootlings (grafted or ungrafted)

have been drawn up for the current year, and copies of same will shortly be available on application.

Beyond the necessary alterations of dates (substitution of 1918 for 1917, &c.), the conditions are much the same as for last season. There is no alteration in price.

The time within which applications will be received remains as it was last year, as will be seen below. Applicants are required to finally decide, when filling in their application forms, as to their stock and scion requirements; no amendment can be permitted later.

It will suffice here to explain that resistant vines are supplied to intending planters in any of the following forms, and at the prices stated; packing extra in the case of consignments forwarded by rail:—

Resistant rootlings, grafted with scions previously supplied by applicants, at per 1,000, £6.

Resistant rootlings, ungrafted, at per 1,000, £1 10s.

Resistant cuttings, at per 1,000, 15s.

Application Forms.

No application will be entertained unless made on the forms supplied for the purpose, which are obtainable from the Director, Department of Agriculture, Melbourne, or from the Principal, Viticultural College, Rutherglen.

Separate forms are provided for (*a*) Grafted Rootlings (*b*) Ungrafted Rootlings and Cuttings. Applications must be filled in on the proper forms.

Each applicant for forms will be supplied with a copy of the detailed conditions governing the distribution of phylloxera-resistant vine rootlings and cuttings.

Applicants are earnestly requested to thoroughly familiarize themselves with these. *They are warned that under no circumstances can any departure be permitted from the regulations governing the distribution as detailed therein, nor can any request for special consideration be entertained.*

Dates before which Applications must be made.

For Grafted Rootlings (1919 distribution, June to August inclusive), applications will be received until 30th June next. (For the 1918 distribution the time for receiving applications closed on 30th June, 1917, and present applicants cannot be supplied until 1919.)

For Ungrafted Rootlings, to be distributed from July to August inclusive, 1918, applications will be received until 31st July, 1918.

For Cuttings (see conditions), applications will be received until 30th June, 1918.

Supplying Clean Districts.

Rootlings and cuttings cannot be sent from nurseries in phylloxerated districts to clean districts. A limited number of clean ungrafted rootlings are, however, available for distribution to clean districts. The price charged is £2 per 1,000, packing extra. Applications for these will be received by the Principal, School of Horticulture, Burnley, until 1st June, 1918.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Principal, School of Horticulture, Burnley.

The Orchard.

As soon as the fruit is off the trees, the land should be well ploughed and left in a rough condition until the spring ploughing. If not already done, and the orchard conditions demand it, there is still time to put in a leguminous crop for green manuring purposes. But this should be done as early as possible, so as to give the crop a chance to make some good early growth. Soils deficient in lime or in organic matter are always benefited by a crop of green manures. Where stable manure is unprocurable, the green manure crop is the only means of adding organic matter to the soil.

Pests and Diseases.

All second-hand and old cases should be thoroughly overhauled. It is preferable to do this work now, instead of leaving it till spring, when the rush of other duties will certainly prevent it being carried out. The cases, if not bad enough to be destroyed by fire, should be dipped for some time in boiling water. And this is not only for the killing of the codlin larvæ, but also to destroy larvæ or eggs of any scale or aphis, and also any spores of fungus diseases that may have found lodgment therein.

As soon as the trees have shed their foliage they may be sprayed with red oil emulsion for woolly aphis, peach aphis, and the bryobia mite. And this should be done before pruning, so that in handling and carrying the prunings the pests will not be spread about the orchard to infect the clean portions.

Flower Garden.

The removal of permanent shrubs and palms, and the planting out of evergreen trees, shrubs, and herbaceous divisions should not be delayed any longer. The nursery section of this class should be cleared out into the garden at once. It is a mistake to wait, as many growers do, for the removal of such plants until the winter season. If planted out now while the ground is warm, the roots of the plants have a fair chance to grow, to take a considerable hold of the soil, and to establish themselves in their new location before the growth period ceases. Then, after the winter's rest, they are ready to break away into new growth, both in the roots and crown, with the advent of the first spring weather. When planted in winter they have no chance to grow; the roots remain as when planted, and with every chance to rot in the cold, wet soil, the foliage becomes yellow and debilitated, and the plant, if it does not succumb, often takes the whole ensuing season to recover its general health. And then, of course, the season that has been lost can never be regained.

Bulbs, tubers, and corms of spring-flowering plants should now all be planted. As they appear above ground, they should be protected

from the ravages of snails and slugs, as these pests have a very great liking for these succulent growths. A good surface dressing of broken leaf or dust tobacco will effectually deal with these pests. In fact, the gardener who constantly uses tobacco, either in the leaf, stem, or dust forms, will very soon be in the happy position that slugs and snails will cause him no anxiety whatever. Besides, the tobacco has manurial properties which are also valuable.

Pansy and any other seedlings, also rooted layers and cuttings, may now be planted out into their permanent positions.

Sowings may also be made of any hardy annuals, such as antirrhinum, aquilegia, correopsis, Canterbury bell, dianthus, everlastings, foxglove, gaillardia, hollyhock, larkspur, leptosyne, lobelia, marigold, pansy, petunia, stock, sweet peas, verbena, wallflower, &c.

Vegetable Garden.

There should now be no untidy or undug beds in the kitchen garden. The vacant beds should all be well dug over and prepared for the planting of vegetables for use in spring. In digging, a top dressing of manure should be given; this may be dug in. All weeds, too, may be forked into the trenches, and covered well with soil as each spit or length is dug. A dressing of lime is very beneficial at this time of the year three or four weeks after the manure or weed dressing.

A start should now be made at cleaning out the asparagus beds. This vegetable is most popular, and yet one rarely met with in ordinary household gardens. It is supposed to be difficult to grow, but this supposition is not borne out, as, once established, a bed of asparagus is one of the most easily managed plots in the whole garden. Depth of good soil and plenty of manure are all that this plant requires.

In establishing a new bed, it is advisable to see that there is a good depth of 2 or 3 feet of rich, well-manured soil. If this is not present, the soil should be dug out to that depth, and thoroughly mixed and enriched with well-rotted manure before being replaced. A bed deeply prepared, and supplied with ample quantities of manure, should last without replanting for very many years. The young plants or crowns should then be planted in trenches, keeping the rows 2 or 3 feet apart. An asparagus bed requires ample and direct exposure to the full rays of the sun. The asparagus should not be cut during the first season after planting; in fact, it is better to allow it to go uncut for two seasons. As little foreign weed growth as possible should be allowed in the beds, but, when they are not producing culinary asparagus, rows of lettuce, beans, radish, &c., may be grown between the crowns.

Towards the end of April the tops may be cut down, the beds cleaned, and a good top dressing of stable manure given. Chemical fertilizers, such as bonedust, sulphate of ammonia, and sulphate of potash, may be given as a substitute to organic manure. In the past it has been the custom to annually top-dress the beds with salt. It was supposed that, as asparagus in its native habitat was usually found in sandy soils near the sea coast, the plant required salt or a saline soil to produce successful results. It has latterly been found that salt is not at all essential to good growth, and that the plant will readily adapt itself and grow well in soils of not at all a saline character. Where potash has taken the place of salt, quite improved results followed.

It is a good rule to observe that no ripe seeds should be allowed to fall on the beds; they should be stripped off the plants before they have a chance to drop. Seedlings will become a nuisance in the beds, and they interfere with the regularity of the rows.

A few early peas, also some broad beans, may now be sown; cabbage, cauliflower, and other seedlings should be planted out from the seed beds. All garden herbs, such as thyme, mint, horse-radish, sage, &c., as well as rhubarb, should be divided and planted out where necessary.

Onion seeds for an early crop may be planted out towards the end of the month. Brown Spanish is very hard to beat as an all-round onion, while the variety of Early Brown Spanish may be relied upon to produce an early crop.

SAVING VEGETABLE SEED.

A shortage of many kinds of vegetable seeds has developed during the past two years. Many of these are of our ordinary garden vegetables that produce seed the first year. They include radish, lettuce, tomato, cucumber, melon, and squash, which can be easily harvested for seed purposes.

There are a few important points to be observed by the farmer when saving any vegetable crop for seed. The field, before harvest, should be carefully gone over, and all plants not true to name or type should be pulled up and removed.

Each field of any variety should be harvested separately, and in subsequent operations care should be exercised that the seeds do not become mixed with other varieties. The name of each variety should also be positively known, especially if it is intended to market the seed. Buyers have no use for seed identified merely as "early" or "late."

The annual varieties of vegetables most easily harvested for seed are given below, together with brief directions as to the methods.

Radishes.—When the stalks begin to show many brown pods the heads should be gathered and placed thinly on canvas in a sheltered, well-ventilated place. In a few days the pods will be dry enough to thresh. This can be done by using a round wooden stick like the old-fashioned flail. A piece of canvas should be spread on the threshing floor to catch the seeds. After threshing the seeds may be separated from the chaff by the use of an ordinary fanning mill. If the seeds are not thoroughly dry they should be spread thinly on canvas or on trays and exposed to the sun during the day and carried inside at night.

Lettuce.—The lettuce plants, when the seeds are ripe, are cut with a sickle. The seeds are flailed out on canvas in the same way as radish. As lettuce seed is very light, care must be used to prevent loss.

Vine Crops.—Under this heading are included cucumber, watermelon, cantaloupe, squash, and pumpkin. The methods of harvesting are similar for all these crops. When the crop is ripe the fruit is removed from the vines and crushed or cut in half, and the seed, pulp, and juice separated from the rind, except that in the case of cucumbers all the fruit is

crushed. The seed, pulp, and juice is then placed in a tank or barrel and allowed to ferment for from four to six days, stirring every day to prevent crushing on top. The seeds are then washed in a trough, having a screen bottom, with running water. The good seeds sink to the bottom, while the light seeds and pulp float off. After washing, the seeds are placed thinly on trays having wood, wire screen, or canvas bottoms, and exposed to the sun and wind during the day and carried into sheds at night. In a few days the seeds will be dry, when they can be cleaned in a fanning mill if desired.

Tomatoes.—When ripe the tomatoes are ground or crushed, and after standing a few days are washed in running water. Long troughs having riffles in the bottom are used to catch the good seeds as they settle, while the pulp floats off with the water. The seeds are then rinsed by hand and spread thinly on racks or trays to dry.

In saving seed the principal point to remember is that the seed should be thoroughly dried before storing and should then be kept dry. The greatest enemy of stored seed is moisture.

When the seed is ready to market the farmer should get in touch with any of the larger seedsmen. When writing to these firms a sample of a few ounces of the seed should be sent, and a statement made as to the amount offered for sale, the name of the variety, and, if possible, the source of the original seed.

Following are brief instructions for saving some of our principal biennial root crops for seed:—

Onions.—The onion bulbs should be pulled a little earlier than when used for food, and should be cured, with the tops left on, where there is a free circulation of air, but protected from direct sunshine and rain.

The seeds form in heads at the top of the main stalk. The seeds turn black before they are ripe. The heads should not be gathered until there is danger of loss of seed from shattering. The heads are then cut from the stalk and spread upon canvas to dry.

Beets, Turnips, and Carrots.—The culture for these root crops is as follows:—When the roots mature they should be pulled and the tops removed. The crowns should not be injured, as the growth the following spring starts from them.

The best roots only should be selected. Those of medium size, smooth, and symmetrical, are best. A small root, if well proportioned, will usually produce as much seed as a larger, ill-shapen one. The roots should be stored for the winter in a moist cellar or in shallow trenches covered with straw and dirt to prevent freezing. If the latter method is used, ventilation should be provided to allow for the escape of gases and the entrance of fresh air.

Set the roots as early in the spring as possible after danger of frost is past, with the crowns two or three inches below the surface of the soil.

Sometimes, when an extra large growth is made, it is necessary to support the seed stalks When the seed is matured and begins to shatter, the plants should be cut and put in a well-ventilated place to cure.

—*The Queenslander,* 16th March, 1918.

MILK FEVER.

Writing to the young dairy farmers in the State of Wisconsin, America, the editor of *Hoard's Dairyman* asks:—"How many of you juniors know what milk fever is, and can tell when a cow has it? It is the one disease which is liable to attack high-producing cows right after calving, and unless the cow attacked is promptly treated, it is very apt to prove fatal. Therefore, every junior dairyman should know something about this disease. In the first place, it attacks only high-producing cows, and for that reason is especially liable to cause great loss. The heifer with her first calf is very seldom attacked, and only once in a while is one with the second. Neither are very old cows in much danger. The well-fed cow that is in good flesh when she calves is more liable to have the disease than a thin, underfed one, and for this reason dairymen used to almost starve their cows as calving time approached, so as to have them thin when they freshened. However, this is no longer necessary. We can say then that milk fever is most liable to attack well-fed cows four to ten years old that are heavy producers. Now, how can you tell when a cow has the disease? In the first place, it usually attacks the cow within a day or two after calving. The animal appears to be nervous or excited, and may stamp with her hind feet or step as if they were sore. If she walks around, you at once notice that her gait is not natural, her hindquarters sway from side to side, she soon staggers, and finally falls down. Sometimes she is able to get up again, but even so, soon falls a second time. This is because the hindquarters, and later the whole body, gradually become paralyzed. At this time the cow usually lies in the position shown in the picture, on her right side with her head around towards the left flank. Cows with milk fever are almost always constipated, and this often is the cause of serious trouble. The dairyman tries to give her a dose of Epsom salts to relieve the constipation; and if paralysis has already started, the animal cannot swallow, because it has already affected the throat. The medicine then passes down the windpipe to the lungs and causes mechanical pneumonia, which may prove fatal even if the cow gets over the milk fever. Therefore, never drench a cow showing symptoms of milk fever. Notice that this disease is called milk fever. From the name, we would expect the affected cow to have a high temperature, but this is not the case. The normal temperature of a cow is usually about 102 deg. F. At the beginning of the disease this may run up to 103 deg., but it soon drops down to about 96 deg. or 97 deg.; so that milk fever is really not a fever at all, but quite the opposite.

Treatment.—In spite of the fact that this disease is so serious, the treatment for it is very simple. After you once understood it, any of you juniors could use it if necessary. Practically all that it consists of is pumping the cow's udder full of air with an instrument which works like a bicycle pump. First, have the cow in a good, clean place on plenty of clean straw. Wash her udder, teats, and especially the ends of the teats, well with soap and water. Then wash the teats again with an antiseptic solution like 5 per cent. carbolic acid or 3 per cent. creolin. The milk fever outfit must also be cleaned. Boil the milking tube for 15 minutes in water, and clean the rest of the apparatus thoroughly. Finally, put clean, absorbent cotton in the metal container, and have

four wide pieces of tape or cloth handy. The cotton is used to filter the air or remove the dust from it. Insert the milking tube in one of the teats, and pump that quarter of the udder full of air. Then withdraw the milk tube, pinch the teat to stop the air from leaking out, and tie one of those pieces of tape around it tight enough so the air cannot escape. Disinfect the tube, and do the same thing with each of the other three-quarters of the udder. Unless care is exercised to thoroughly disinfect all instruments, teats, and hands, mammitis is almost sure to follow, with the subsequent loss of one or more quarters of the udder. This is all there is in the treatment, and as a rule it cures in a few hours at most. If the cow does not begin to get better in four or five hours, repeat the treatment. Now, if one did not happen to have a milk-fever outfit, and could not get one at once, it would be possible to make a temporary one, using a bicycle pump, a piece of rubber tubing, and a milking tube. With this the cottón could, of course, not be used."

NEW ZEALAND DAIRY COWS.

It is satisfactory to know, on good authority, that our New Zealand dairy cows are improving in their average production. Mr. W. M. Singleton, Assistant Director of the Dairy Division, in an illuminating article in the *Journal of Agriculture*, makes some good points in general advocacy of the worth of herd-testing, &c. According to the 1916-17 enumeration per the Government Statistician, our dairy herds totalled 777,439 dairy cows, an increase of 143,706 in six years. On a conservative basis, it was estimated that, during the 1916-17 season, over 125,800,000 lbs. of butter-fat was produced, as against 90,000,000 lbs. of butter-fat in 1910-11—the increase of cows during the two periods being 22½ per cent., and the butter-fat increase over 39 per cent. Or, in other terms, the average cow accounted for a production of 142.1 lbs. butter-fat in the 1910-11 season, as against 161.8 lbs. of butter-fat for the average cow in the 1916-17 season. As Mr. Singleton says, *inter alia*, an increase in the Dominion's exports of food products, due to the keeping of an increased number of cows, is commendable enough; but even more praiseworthy is the increase of production due to the improvement of the average dairy cow. A further increase of production may naturally be expected as time goes on. The Dairy Division may rightly claim, as it does in the article before us, that the period during which this improvement in the production of the average New Zealand cows has been brought about synchronizes with that during which the cow-testing movement has been developed. We can but regret that the movement has not grown in the South as in the North Island, and would welcome active propaganda and practical work in our midst. We are told that the dairy farmers are more circumspect in the purchase of their bulls than formerly. The use of pure-bred bulls of dairy breeds has had a marked influence on the production of our dairy herds. The certificate of record-testing system, C.O.R., carried out by the breeders and the Dairy Division, has been a most potent influence at work in increasing the demand for bulls which will assist in building up the quality of our dairy herds. It is an interesting movement, and soon,

no doubt, it will be quite a common thing to demand the milk and butter-fat ancestry of dairy cattle offered for sale. We are glad to meet such an unequivocal statement as the following:—" In equal environment, an increase in the productive capacities of daughters over their dams can only be attained through having them sired by a bull who carries transmissible hereditary factors which represent a dairy strain that is superior to that of the cows with which he is mated. Breeders have evidence of the keenness of dairymen to purchase bulls from C.O.R. cows. Some breeders who have extensively patronized the C.O.R. testing have disposed of all their bull calves before the summer was over. This is quite a contrast to earlier conditions, when sales were frequently difficult to make. Such a healthy state of affairs is tangible proof that more dairymen are appreciating the importance of a good bull, and are recognising that his dam's record, and the records of his sisters or daughters, are the best indices to his ability to transmit the necessary factors of improved butter-fat production. Many herds in our dairying districts average more than 200 lbs. of butter-fat per cow, a lesser number average over 300 lbs., and in a few cases the average cow of the herd produces 400 lbs. butter-fat or more. Those herds averaging 300 lbs. fat and more, cannot be maintained on a constructive basis unless by wise selection of sires. If sires of exceptional merit are necessary in these good herds, the owner of a herd of average cows producing 160 lbs. butter-fat may expect to see a greater percentage of improvement by the use of such a sire, provided the daughters have conditions which will permit of their doing themselves justice as producers. The work which the Dairy Division has been doing along the line of assisting the owners of dairy herds, through C.O.R. testing and cow-testing association effort, is surely more than justified by the betterment which is evidenced. The margin between the production of our average cow and that of the better herds is evidence of the great work yet to be accomplished. Economy in foodstuffs is general and necessary. Since the beginning of the war the world's live-stock statistics show a decrease of over 33,000,000 head in cattle, sheep, and pigs. This decrease has doubtless become greater, and indicates an increasing shortness of all food materials supplied by live-stock. It would, therefore, be a patriotic as well as a profitable effort for our dairymen to do all that is possible in assisting to make good the deficit." And we would add, there are no better means than on the lines suggested.

—*Otago Witness*, 3rd April, 1918.

REMINDERS FOR MAY.

LIVE STOCK.

Horses.—Those stabled can be fed liberally. Those doing fast or heavy work should be clipped; if not wholly, then trace high. Those not rugged on coming into the stable at night should be wiped down and in half-an-hour's time rugged or covered with bags until the coat is dry. Old horses and weaned foals should be given crushed oats. Grass-fed working horses should be given hay or straw, if there is no old grass, to counteract the purging effects of the young growth. Attend to teeth and feet of horses to be turned out for the winter.

Cattle.—Cows, if not housed, should be rugged. Rugs should be removed in the daytime when the shade temperature reaches 60 degrees. Give a ration of hay or straw, whole or chaffed, to counteract the purging effects of young grass. Cows about to calve, if over fat, should be put into a paddock in which the feed is not too abundant. Calves should be kept in warm dry shed. Observe strict cleanliness in feeding to avoid losses and sickness incidental to calf-rearing.

Pigs.—As recommended in Reminders for April.

Sheep.—Keep ewes with lamb in medium condition. Best lambing results are obtained when ewes are neither poor, nor excessively fat. Once the lambs arrive then the most liberal treatment possible is in the main the most profitable. Ill-fed ewes are bad mothers, indifferent to the new-born lamb, and rearing them badly afterwards, particularly very young or very old ewes. Select fine weather for lamb-marking. Yard lambs over night. Never castrate or tail high-conditioned lambs immediately on being run in and overheated. The risk with large lambs will be lessened if they are allowed to stay in the yards an hour or two after castration and the coagulated blood drawn, which in many cases will be found retained in the groin and purse, no matter what method of opening the purse is used. In tailing never draw tails tight. Projecting bone delays healing, especially when cutting off with hot blades. Even with the knife leave enough loose skin to come over and cover the vein and check the usual strong rush of blood from lambs on well-fed mothers.

Poultry.—Feed animal food to forward pullets, about ½ oz. daily, and equal parts heavy oats and broken maize at night. Add lucerne chaff to mash daily. See that fowl houses are free from draughts to avoid colds, also that they are free from red mites. Use Epsom salts freely to avoid Roup and Chicken Pox.

CULTIVATION.

Farm.—Dig main crop potatoes. Push on with ploughing and sowing of cereal crops, including peas and beans. Green fodder (as for April) may still be sown. Land for maize, potatoes, and other root crops should be prepared and manured. Flax may be sown. Transplant Chou Moellier and Giant Drumhead cabbage plants in rows 3 feet apart. Complete sowing permanent pastures with grasses and clovers.

Orchard.—Plough, manure; apply lime to orchard lands at rate or 5 or 10 cwt. per acre where soil is sour. Spray trees infested with scale insects, Woolly Aphis, and Bryobia Mite with red oil or crude petroleum. Clean all rough bark from trees. Commence pruning early varieties at end of month.

Flower Garden.—Digging, manuring, and pruning; trench and drain where necessary. Dress the surface with lime. Continue to sow hardy annuals. Bury all leaves, soft-wood cuttings, and weeds. Continue to plant spring blooming perennials and other plants. Plant cuttings of carnations and roses.

Vegetable Garden.—Cut down and clean out asparagus beds. Apply manure and lime dressings. Cultivate deeply. Plant out seedlings and early potatoes; sow peas, broad beans, carrots, and parsnips.

Vineyard.—Subsoil land for new plantations if not already done. This work should be carried out as long before planting as is practicable. Vine-growers are warned against the too common practice of feeding off foliage after vintage. Any small advantage in the form of stock feed is only gained at the cost of a reduction in the following season's crop, owing to interference with accumulation of reserves, which continues so long as the leaves remain green. Sheep should not be allowed into the vineyard until all leaves have changed colour. Early and deep ploughing is strongly recommended. Manures should be applied as early as possible. Peas, &c., for green manuring, should be sown without delay, in order to take advantage of early rains.

Cellars.—Rack or fill up (preferably the former) dry wines as soon as a lighted match, introduced at bung hole, is no longer extinguished. Sweet wines should also be racked and fortified to full strength.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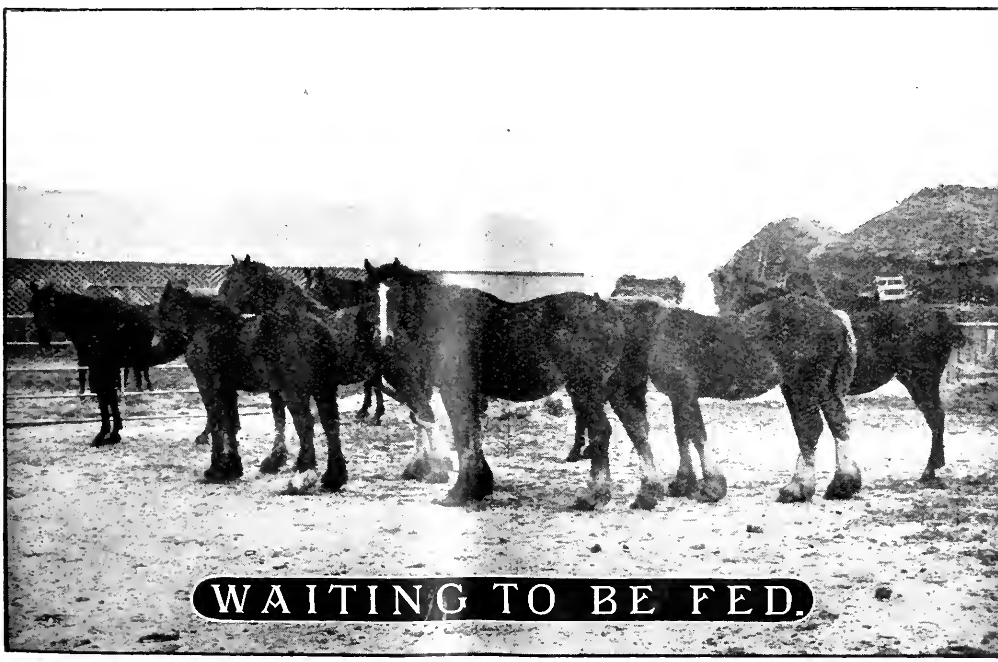

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OF

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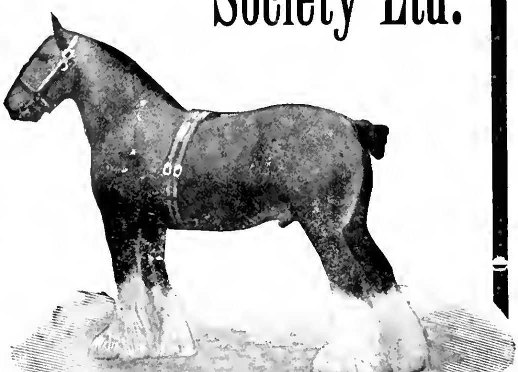


THE JOURNAL

OF

The Department of Agriculture

OF

VICTORIA.

Vol. XVI. Part 5. 10th May, 1918.

AMERICAN AGRICULTURE.

Report to the Director of Agriculture on Agricultural Education Methods and Agricultural Research Work in the State of California, by A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent.

I. Introduction.

California, from an agricultural point of view, is probably the most interesting of all the States in the Union. The physiographic features of the State, the long coast line, and the movement of the great air currents from the Pacific give it a range of climatic conditions wider that those possessed by any other State. It is nearly 800 miles in length, and extends from 32½ to 44 degrees north latitude, and, as its land surface varies all the way from 200 feet below to 13,000 feet above sea-level, it possesses greater diversity in climate than any other State in the Union.

In the south long-stapled Egyptian cotton and semi-tropical products thrive to perfection, whilst in the north winter cereals are extensively grown. Indeed, in one section of the country—Butte county—such a remarkable diversity of crops as apples, pears, barley, oats, rice, cotton, and oranges are grown extensively within a radius of 20 miles from Chico. The variety of climatic conditions conferred on California by the topographical features of the country accounts in large measure for the range of crop products and also probably explains the large range of subjects dealt with at the College of Agriculture at Berkeley. In order to appreciate the character of the agricultural institutions a preliminary account of the physiographic, climatic, and soil conditions is desirable.

2. Physiographic Features of California.

California is, roughly, 780 miles in length, and varies from 150 to 350 miles in width. It has an area of, approximately, 100,000,000 acres, and is, therefore, not quite twice the size of Victoria.

The greater part of the country is mountainous in character, less than 30 per cent. of the area being in farms. The estimated population of California is at present almost exactly 3,000,000. On the eastern side of the State are the Sierra Nevadas, and on the western side the Coast Range. Between them is the great interior valley drained through the San Francisco Bay. The upper part of this area is known as the Sacramento Valley (drained by the Sacramento River), and the southern part as the San Joaquin Valley, drained by the San Joaquin River. In the northern part of the State the mountains unite, forming the Siskyou Mountains, with Mount Shasta as the highest Peak. In the south, they are united by a cross range called the Tehachapi Mountains, and beyond this is Southern California, with the San Bernardino Range separating the highly developed valleys from the more or less desert regions eastward.

California has the highest and lowest land in the United States, the greatest variety of temperature and rainfall and products of the soil. Thus, in the Imperial Valley, near the border of Mexico, the normal rainfall is but 2 inches per annum. In the north-western part of the State the rainfall is 60 inches.

Again, in the Imperial Valley, the Salton Sea is actually 200 feet below sea-level, whilst many peaks in the Sierras exceed 12,000 feet in height.

3. Climatic and Soil Conditions of California.

In the agricultural areas of California the rain falls almost exclusively in winter and spring, while the summer is practically dry. The distribution of rainfall is not unlike that in Western Australia, where as much as 85 per cent. of the annual fall occurs between May and September, except that in California the rainy season is from November to March.

As with us, winter cereals, principally barley, are grown on the dry lands, whilst fruit, garden products, and dairying are conducted in the better rainfall areas, or under irrigation.

On the whole, California has a much larger area of dry country than Victoria. The Imperial Valley and the greater part of the San Joaquin Valley—two of the great valleys of California—have an annual rainfall of from 2 inches to 10 inches. These are the two valleys where irrigation has been so much developed. In fact, 95 per cent. of the cultivated area of the Imperial Valley is under irrigation. Between the Coast Range and the sea, and in the Sacramento Valley, the rainfall is ample for raising fair crops without irrigation. Still, even on these lands, irrigation is extensively practised. The summers are dry and hot. In the interior valleys the summer would be much like our northern wheat areas. Only in the Imperial Valley does the heat in summer become intolerable, and here temperatures of 120 degrees in the shade are frequently registered. No wonder that semi-tropical fruits and cotton grow well in this valley. In 1910, according to the United States census, no less than 2,664,104 acres were irrigated, and the acreage under irrigation to-day is estimated to be well over 3,000,000 acres.

On the whole, the soils of California are fertile. The soils of the great interior valleys are deep, friable, porous, and, in most cases, rich.

Where the rainfall is sufficient, or where irrigation is practised, fruit, alfalfa, and vegetables can be grown to perfection. Remarkable yields of almonds, peaches, apricots, figs, and vines are recorded throughout these two great valleys, while alfalfa commonly yields from 5 to 8 tons per annum.

The soils are, I should say, much more free working, friable, and deep than the general run of Victorian soils, and in most cases there are no highly-retentive clay subsoils underneath. Deep brown sandy loam seems to be the most common type, and it is on these types that heavy crops are obtained. In the coastal valleys, *e.g.*, Santa Rosa Valley, black adobe soils are met with (soils not unlike those of the Wimmera), but even these appear more friable than their counterparts in Victoria. In the San Joaquin Valley there is a large area of alkali land—sandy soils, where irrigation has raised the soluble salts near the surface. Large areas of such land are found in Kern, Tulare, Kings, and Fresno counties. At present portion of these areas are falling out of cultivation. The remedy is that prescribed for the Cohuna area, in Victoria—provision of drainage channels to take the salts to the rivers draining the area. The eastern portion of San Bernardino, Inyo, and Riverside counties—a large area—is desert country, deep white gravelly soils, with a low rainfall, and covered with desert vegetation.

4. ECONOMIC CONDITIONS.

There is a good demand for all Californian products, and these products meet with a ready sale in the eastern markets. But the price of many of the commodities are not as high as in Australia. For example, take one of the staples—raisins. The usual price received by the grower is 4 cents a lb. ($80 a ton, roughly £16). Last year they received 4½ cents per lb. ($90 per ton, equal to £18). The price received by the Mildura grower is probably double that received by the California grower. Then, again, the cost of labour in California has always been higher than in the eastern States. The price of pruning vines at the present time is $3 a day. At Kearney Park (Fresno), a gang of 40 men were engaged in pruning a vineyard of 800 acres when I visited the county.* Picking is usually done by contract. At Kearney Park last year the average amount earned by 300 pickers was 5.2 dollars a day (23s.). The standard rate is $3 per long ton of fruit (100 trays of 22 lbs.). The manager of Kearney Park produced time and pay sheets to show that the Japanese labourers in his employ earned as much as $12 a day for the picking season (about five weeks) last year. The standard price for ordinary farm labour is $2 to $2½ a day, according to the class of work. Most of the fruit industries are organized on a co-operative basis, and practically the whole of the crop is handled and sold on a co-operative basis. Thus the California Fruit Growers Association has its head-quarters in Los Angeles. It has in its organization 80 per cent. of the growers of the State. The remaining 20 per cent. not under the Citrus Association are mostly scattered over the State, and are small men.

This organization takes control of the entire crop, and has citrus exchanges established in every city of the United States for selling the

* At the time of my visit the majority of the workmen came to work in motor cars of their own. A Ford car costs $470 and petrol 20 cents per gallon.

fruit on the most advantageous terms. An advance is made to the grower at the beginning of the season to cover costs, and at the end of the season the grower receives the whole of the balance of sales, less marketing and operating expenses—not unlike the Australian wheat pool. Similarly, the raisin growers have their association; so also have the peach, apricot, and almond growers. Co-operative disposal of every type of crop, save cereals and vegetables, seems to be the regular thing in California.

5. RESEMBLANCE TO VICTORIA.

On the whole, Victoria is very like California in climate, soil, and density of production. But the difference lies in the extent to which California has developed her irrigation resources and intensified her agriculture. Only on the poorest land do we find cereals grown. Where the soil can be irrigated, fruit, alfalfa, and vegetables are grown.

In regard to the cereal production, it is interesting to note that barley is far more intensely grown than wheat. Thirty-three and a third million bushels of barley were raised from 1,190,000 acres in 1915, as against 5,600,000 bushels of wheat from 350,000 acres. Strangely enough, barley has the reputation of being more reliable and hardier than wheat, and better able to stand dry spells. It certainly matures much quicker than wheat, and, cut at the right time, makes excellent hay. This year California has suffered from the worst drought since 1849. Wheat is usually sown in December, but this year most of the wheat planted failed to come up. The barley crops, however, are doing fairly well, and are in striking contrast to the wheat crops.

6. FARM CROPS OF CALIFORNIA.

A few words regarding the farm crops of California may be added, in order to give an idea of the intensity of the farming practised in a country very like our own. Unfortunately, the State Statist's figures are not complete. I shall, therefore, take the census figures of 1910 compiled by the United States Department of Agriculture. The following was the value of the principal farm crops in 1910:—

Fruit and nuts	$48,417,655
Cereals (principally barley)	28,039,826
Hay and forage (principally alfalfa and barley)	42,187,215
Edible beans	6,295,457
Beet sugar	4,335,358
Potatoes	5,235,073
Vegetables	6,886,885
Flowers and small fruits	5,400,515
Total farm crop	$153,111,013

Since 1910, production of some of these crops has been greatly increased. This applies particularly to sugar beets, edible beans, hay forage, and fruits and nuts, whilst rice and cotton are now being grown in large quantities. Thus the cotton crop for 1917 is estimated to be worth $12,000,000, and the sugar beet crop $20,000,000. Reliable statistics for the live stock industry are wanting. The output of dairy products, however, for 1910 was $20,443,977, and for eggs $10,262,694.

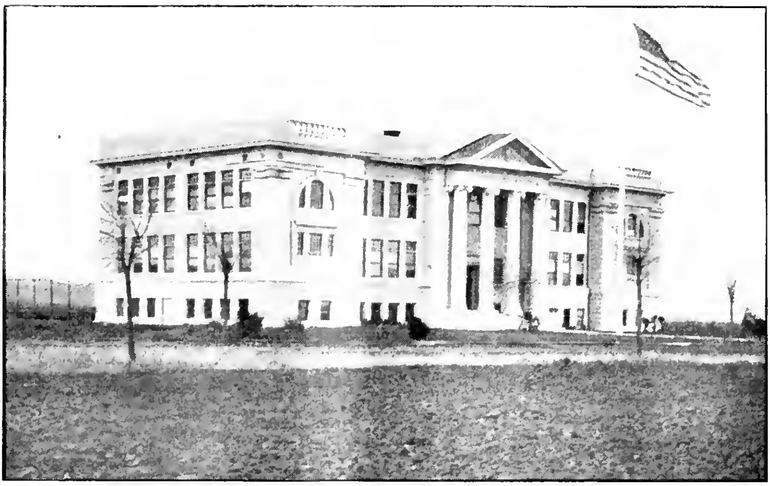
All these figures point to the intensification of farming as compared with Victoria, and much greater diversification in crop production.

AGRICULTURAL EDUCATION IN CALIFORNIA.

The educational system in California is very similar to that of Victoria, but the system of control is utterly different.

(A) The County is the Unit.

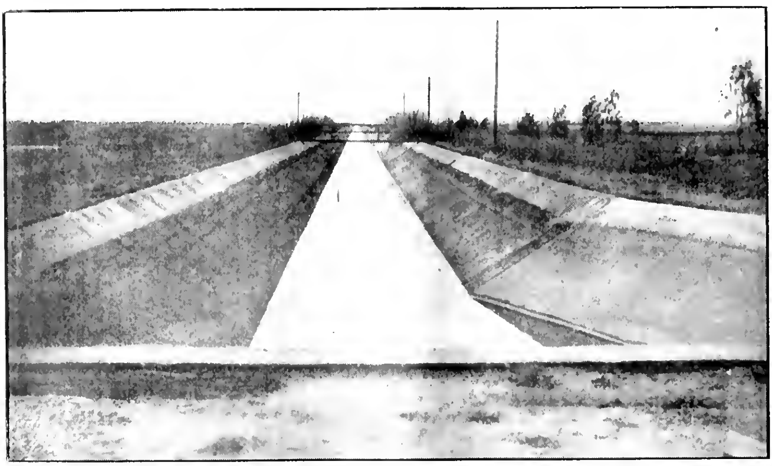
Each county of the State controls its own educational system, and is responsible for raising by taxation the necessary funds for this purpose. The statutes or the political code of California prescribe what type of education shall be given by the State as a whole, but it is left to the individual county Government to see that the educational programme is carried out. I am given to understand that the schools in each State of the Union are governed in a similar manner. This is



High School at Pattersen. Erected at a Cost of 60,000 dollars.

quite the opposite of the centralized administration of education which prevails in the Australian States. The educationalists contend that the county system produces excellent results. There is rivalry between the counties, and each takes great pride in the schools erected within the county. It develops county initiative in educational policy. The high schools and grammar schools throughout California are on the whole magnificent buildings, replete with elaborate teaching equipment, and giving evidence of liberal policy and wise provision for the future. As an example, a new irrigation settlement at Patterson, which I visited, and which comprises 17,000 acres of land, the 600 settlers of Patterson erected an elementary school, at a cost of $55,000, and a high school at a cost of $60,000. The money was raised by bonds floated at 5 per cent., repayable in 40 years. Initiative is shown, too, in moulding the school policy in accordance with the trend of the people's requirements in the county. Thus Oakland is a centre of manufacturing industries. It has erected a magnificent technical school, with a highly-trained technical staff, and has elaborately equipped it from

funds largely obtained from its own citizens. Again, at Gardena, 14 miles from Los Angeles, which is the centre of a rich agricultural district, a high school was used to train boys in agriculture. A farm of 20 acres of rich land was purchased and added to the school, and each year from 80 to 100 boys are given a course of training in agriculture. It may be claimed that uniform training and uniform standards of teaching naturally arise from a system of centralized control, and that the cost of administration is less in such a system. The Californians say, however, that you get greater efficiency with local government, and, as far as uniformity is concerned, the high-school graduate of, say, Ohio, has almost exactly the same standard of training as the high-school graduate of Idaho or California. Moreover, it is claimed that, in a big country like the United States, it is wise to give each community the opportunity to develop its own educational ideals. It promotes among the counties and States healthy rivalry, and when one county adopts any progressive idea, or initiates some successful movement, it is soon followed and tested in thousands of other counties. In a centralized system they say local leadership and progress would tend to be stifled.



Main Channel, Patterson Irrigation Colony.

(B) AGRICULTURE IN THE SCHOOLS.

Education in California is free, secular, and compulsory from 7 to 14. The grades in the system of education are:—

Primary grade, 7 to 10 years.
Grammar school grade, 11 to 14 years.
High school grade, 15 to 18 years.
University grade, 19 and upward.
Graduate work, 23 to 26 years.

Age is recognised as it should be as a factor in education. This is a very important point in agricultural education, and yet it is a factor which is commonly overlooked. In the primary schools, nature-study is one of the subjects of instruction. The children are taught to observe the soil, plants, flowers, animals, insects, butterflies, just as they do in Victoria under Dr. Leach.

An attempt is made to make them appreciate their surroundings, and to slowly unfold the story of nature.

In the summer schools (corresponding to the elementary schools in Victoria, with pupils between grades 5 and 8), the children in the rural districts are usually given lessons in school gardening, and taught simple soil and plant studies. In the high school the study of agriculture is more thorough and systematic, and no less than 2,200 high schools of the United States have been recorded as giving courses of instruction in agriculture.

In California, agriculture is a subject of study in 73 out of 280 high schools on a commercially productive basis.

At the Gardena high school, over 30 boys are now engaged in vocational agriculture. Each has a project, *e.g.*, keeping two pigs, raising chickens, growing vegetables, raising calves, growing sugar beets or alfalfa. They do all the work themselves, and keep time-sheets and check up the whole cost of work, including labour, feed, interest on capital, &c., and, after deducting the marketing expenses, they determine the net profit on the project. Then they write an essay, "How I grew an acre of sugar beets"; "How I raised my pigs," &c. One lad—Gail Poulton—whom I visited, 17 years of age, had three projects: vegetable growing, two brood sows, and a pen of fourteen pullets. He purchased the pigs at six and eight weeks, and fed them on alfalfa, barley, corn, and scraps. He had a record of their weight each month, the amount of food consumed by each daily, the time and cost of attendance of each, &c. He also had a record of the amount of bran, alfalfa, meal, meat, grain, grit, and charcoal consumed by his fourteen pullets each day. He had a record of the daily egg production, and had made detailed notes of the effect of slight alteration of the ration on the production of eggs. He had a detailed analysis of the time and feed costs to date, and the weekly sales of produce. This struck me as a fine educational work. This same lad had also a one-third acre patch of onions, beets, and cabbage, which he intended to market. He had the same detailed notes on costs and time as before, together with notes on growth, appearance of insects and pests, effect of sprays, &c. I asked this lad what he intended doing later on. He replied that he intended going for three years to the University Farm, and then his father would provide a block of land for him.

Previous to 1917, vocational training in agriculture was not given at the high schools of California, though in Indiana and Massachusetts vocational training in agriculture has been in vogue in high schools for some four or five years.

Previously the courses in agriculture at the State schools were science courses with an agricultural bias. Now it is purposed to establish throughout the State vocational courses in agriculture.

These courses will be subsidized by the Federal Government. Under a recent Act—the Smith-Hughes Act—the Federal Government proposes, according to the terms of the Act passed by Congress in 1917—

> "To provide for the promotion of vocational education; to provide for co-operation with the States in the *promotion of such education in agriculture* and the trades and industries; to provide for co-operation with the States in the *preparation* of *teachers* of vocational subjects, and to appropriate money and regulate its expenditure."

The main purpose of this Federal Vocational Act is to promote clearly defined courses in vocational education.

These courses are intended to provide, as far as possible, for finished education in occupations for those who have entered or intend to enter employment without securing a schooling beyond that provided by the elementary school.

The Federal Act states that all those high schools which are to benefit by the Act must—

1. Give the boy who is taking a vocational course in agriculture a project which will occupy six months' practical work either on a piece of land rented by the boy from his father or from the school. Three hours' practical work daily must be spent on this project work on a commercially productive basis.
2. Give each pupil three hours daily, or an equivalent amount of time, to work in school in (1) rural science, (2) rural mathematics, (3) rural English, to supplement the practical work mentioned above, and
3. The practical work must be conducted under the direct supervision of a teacher holding a special certificate in agriculture, or a vocational certificate in agriculture.

Several million dollars have been appropriated for this purpose this year, and the amount appropriated will automatically increase year by year for ten years, when the maximum amount voted will be over 10,000,000 dollars per annum.

Dr. Snyder has been appointed State Supervisor of Vocational Education. I called on him at his office at Sacramento, and had a long discussion on the method of working of this Act, and he was good enough to make arrangements to meet some of the boys who were taking a course in vocational agriculture for the first time.

Dr. Snyder stated that the Department was very short of trained teachers in agriculture. He proposed to get over the difficulty by trying to find educated farmers who are interested in teaching. He proposed to give them six months' intensive teaching at the University Farm, Davis, and pay them commencing salaries of $1,500 to $1,800 per annum.

The general opinion of teachers and University extension workers is that the Smith-Hughes Act will revolutionize the teaching of agriculture in high schools, and will ultimately profoundly influence the work of the agricultural colleges themselves. The Smith-Hughes Act is interesting, because by it the Federal Government has established the principle of Federal aid to secondary education.

The general feeling is that the old method of teaching agriculture in the high schools has not been satisfactory.

In asking for reasons, I have been given the following as mainly the cause of non-success of agriculture as a high school subject:—

(*a*) The newness and the consequent want of a good method of teaching agriculture.

(*b*) The instruction in the high school has been an imitation of that given by the agricultural college—that is to say, there has been an attempt to teach an advanced college course to young boys at the high school, without adapting the courses to the age of the boy, and college courses have been

undertaken in the high school without the facilities which the colleges possess. The methods employed in the high school have been those of the college, overlooking the fact that pupils between 15 and 18 are different from those between 19 and 22, physically and intellectually.

(*c*) Suitable text books for high school instruction have been lacking. Most of the existing books have either been written by University men who knew little of the high school mind, or by high school men who knew very little of practical agriculture.

Dr. Hunt, Dean of the College of Agriculture at Berkeley, in discussing this matter, attributed some of the failure to the school laws. He put the matter in this way:—

"In order to secure a regular certificate to teach in a high school in California, one must have five years' preparation in a University. Under certain conditions, a person having four years' University training, and a special preparation in agriculture, may be allowed to teach agriculture in a high school, but he must not teach anything else, such as chemistry, physics, or botany. The person who has the regular certificate is allowed to teach any subject, whether he has had preparation for it or not. What has happened in far too many cases is something like this: A community having a rather small high school, and struggling to support it properly, starts an agitation for the introduction of agriculture. The school has, say, five teachers—two men and three women. The Board of Education looks around for a teacher of agriculture. To get a man with a regular teacher's certificate would require a salary of $1,500 or $2,000. To secure a man with a special certificate, perhaps $1,200 or $1,500 is required. This means an additional man to teach one subject. The Board of Education cannot afford it. If they employ a man to teach agriculture who has a regular teacher's certificate in place of the man who has been teaching physics and chemistry, they must pay him more than the principal. The result is that the man who is already overburdened with teaching physics and chemistry is asked to take on the teaching of agriculture, though he knows nothing whatever of the subject.

Often he is afraid to get acquainted with the farmers of the neighbourhood, because they might ask some questions which would display his ignorance."

Such is Dean Hunt's view of the situation.

That his view is not overdrawn may be shown by the fact that the Federal Bureau of Education has sought to determine the training of the teachers of agriculture in the 2,200 high schools of the country, and has found that 51 per cent. of the teachers of agriculture in the schools reporting have had no training whatever for agricultural work.

Dr. Hunt considers that the solution for this problem is that where the high school can only afford five teachers, or less, the teacher of agriculture should be principal of the school.

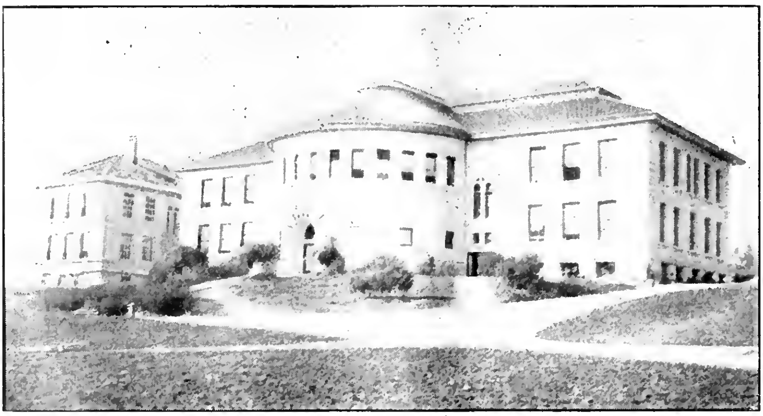
Where the schools are larger, and good salaries can be paid, better results would be obtained when the teacher of agriculture is not charged with the responsibilities of the principal.

THE UNIVERSITIES OF CALIFORNIA.

There are three Universities in California:—

1. The University of California (which is the State University), situated at Berkeley.
2. The Leland Stanford Junior University, situated at Palo Alto, some 30 miles south of San Francisco.
3. The University of Southern California, situated at Los Angeles.

I visited each of these institutions. Only at Berkeley is provision made for the courses of agriculture. The Leland Stanford Junior University was endowed with an estate worth $40,000,000, and has most elaborate and ornate buildings. Its normal attendance is about 2,000 students. At present it does not provide instruction in agriculture, though the regents contemplate providing for an agricultural department in the near future. The University of Southern California appears to be restricted in its work by lack of funds. The principal feature of the institution is the College of Liberal Arts. The majority of the students in attendance take the arts course.



View of the College of Agriculture—University of California.

The University of California is a fully-equipped institution, and is supported liberally by State funds.

I propose to discuss briefly the organization and administration of the University, and then deal in some detail with the work of the College of Agriculture.

The University is administered by a president—Benjamin Ide Wheeler. The president is responsible to a body of regents, sixteen in number. These regents are appointed by the Governor for a term of sixteen years. As the Governor holds office for four years, each Governor appoints four of the sixteen regents. In addition, there are several regents *ex officio*. The regents determine the financial policy. In some States, *e.g.*, Illinois, they are elected by popular vote. Dean Hunt considers the ideal system of University government would be—

(1) A president;

(2) Seven regents, appointed for seven years, one regent being appointed every year.

The University of California has ten colleges, each with its own faculty (each faculty consisting of members of the teaching staff of the college).

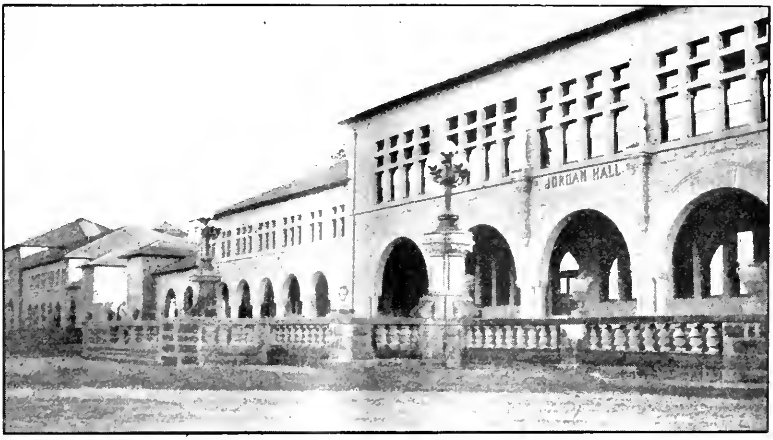
These colleges are:—

(1) Agriculture, (2) Letters and Science, (3) Commerce, (4) Law, (5) Medicine, (6) Mining, (7) Civil Engineering, (8) Mechanics, (9) Education, (10) Dentistry.

Each college has a Dean, who is responsible for the control and administration of the college.

The University spent \$3,500,000 the last financial year, of which approximately \$1,000,000 was spent on buildings.

Of this sum, \$605,000 (£121,000) was spent by the College of Agriculture.



A view of one side of the Campus—Leland Stanford University—showing the Jordan Hall.

The College of Agriculture.

The College of Agriculture is organized to carry out three classes of work:—

(1) Research, (2) Education, (3) Public welfare.

It carries out these activities in the following way:—

(1) *Research:* Funds received from the Federal and State Governments are used to maintain the Agricultural Experiment Station at Berkeley, and to conduct experimental and research work at the University Farm, Davis.

(2) *Education:* The College of Agriculture provides (*a*) University instruction to students who are candidates for the degree of B.Sc. in Agriculture.

(*b*) Farm school instruction at Davis to students of eighteen years who do not take degrees.

(*c*) Short courses of instruction for practical farmers at the University Farm, Davis.

(*d*) Correspondence courses in agriculture.

(3) *Public Welfare:* One of the most remarkable features of the College of Agriculture is the extension work, which has grown very rapidly during the past three years.

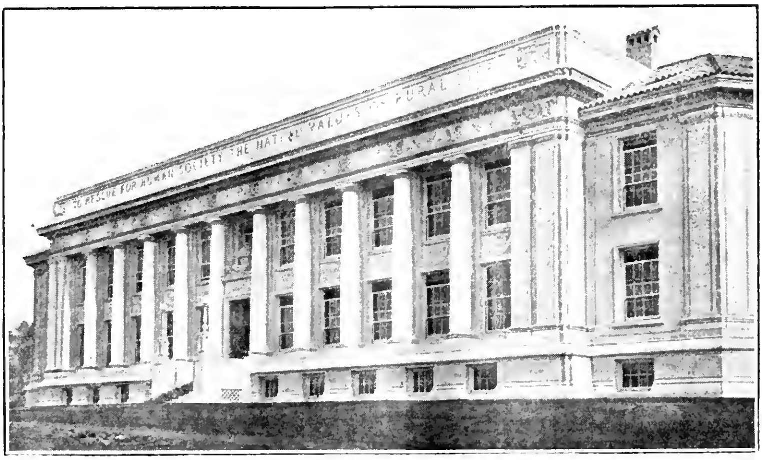
The work of the Extension Department comprises farmers' institutes, the country farm advisers and farm bureaux, and boys' agricultural clubs in rural and high schools.

(1) Research.

The School of Agriculture and the Agricultural Experiment Station are housed in the same buildings. Dean Hunt is head of the College of Agriculture and Director of the Experiment Station.

Most of the research work is done in the laboratories of Hilgard Hall.

Hilgard Hall is a magnificent block of buildings erected by the people of California in memory of Professor Hilgard, the soil chemist, who did so much for Californian agriculture. The money—$350,000—



Hilgard Hall—University of California.

was voted by initiative referendum by the people in 1914. In addition, $25,000 was voted for equipment. Hilgard Hall comprises the second of three buildings which will complete the agricultural quadrangle of the School of Agriculture.

The principal facade is 180 feet in length, and bears the inscription: "To rescue for human society the native values of rural life."

It has three main floors and a basement.

It has six lecture halls, with seating accommodation for 428 students, sixteen laboratories, each holding from 40 to 60 students, 50 offices for professors, assistants, and stenographers.

In addition, there are rooms for students, and special equipment, such as storage rooms, cold storage plant, &c.

Hilgard Hall is the head-quarters of seven divisions of the Agricultural Experiment Station and School of Agriculture—Agronomy, forestry, soil technology, pomology, viticulture, genetics, and citriculture.

I have secured detailed information regarding the construction, equipment, and research work conducted by each of these divisions, as

well as the eleven other divisions into which the college is divided, but it is unnecessary to describe these at the present juncture. The information will, however, be most useful in considering plans for the extension of our own work in Victoria.

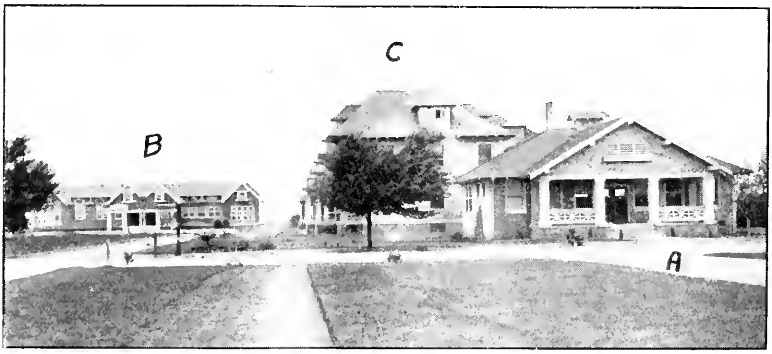
At the time of my visit, the eighteen divisions of the college were engaged in working on 366 projects.

Before any piece of research is undertaken, a statement is submitted to the Director, specifying—

(1) The objective of the research;
(3) The points to be investigated—specific questions to be answered;
(3) Plan of organizing work, or methods of procedure;
(4) Literature of subject.

(2) Education.

The main educational work is preparing candidates for degrees in agriculture.



University Farm, Davis, California.
A. Students' Luncheon Rooms; B, Administrative Office; C, Dormitories.

During the first two years the undergraduate course in agriculture at Berkeley is substantially the same for all students. It gives a training in chemistry, botany, bacteriology, geology, zoology, mathematics, and surveying.

All students are required to acquire a real reading knowledge of some foreign language and a knowledge of their own language.

At the end of the second year a student takes a summer practice course of six weeks, in order to give him some practical knowledge of the phase of agriculture he intends to enter, and to enable him to change if he finds that he has been mistaken in the choice of occupations.

The minimum requirements for entrance at Berkeley are high school graduation (which would correspond to our senior public).

During the third and fourth year the student for a degree may specialize in one of eighteen divisions: (1) Agricultural chemistry, (2) agricultural education (3) agronomy, (4) animal husbandry, (5) citriculture, (6) dairy industry, (7) entomology, (8) forestry, (9) forest utilization, (10) irrigation, (11) nutrition, (12) parasitology, (13) plant pathology, (14) pomology, (15) poultry husbandry, (16) soils and fertilizers, (17) viticulture and venology, (18) landscape gardening and floriculture.

The majority of the students major in agronomy, animal husbandry, dairying, or irrigation, as these are the courses which they find most useful in after life.

In a general way, these courses may be said to prepare for three types of agricultural activity:—

(1) Commercial or productive agriculture. This may be by owning or renting land, or by employment as a superintendent of a farm or ranch.

(2) Professional or technical agriculture, in which a man may become an agricultural or soil chemist, a plant pathologist, a forester; or he may become an investigator in any of the several lines of activity in which the college prepares men.

(3) Teachers of agriculture in high schools, and men who are to become farm advisers.

North and South Dormitories, University Farm, Davis.

THE DAVIS FARM.

The University Farm School, situated at Davis, some 70 miles from Berkeley, is worked in conjunction with Berkeley, and is under control of the Dean of the College of Agriculture.

The heads of departments at the College of Agriculture are also the heads of the corresponding division at Davis.

In discussing the origin and scope of the University Farm School, Dean Hunt said that the school was at first intended for a secondary school, *i.e.*, as a place where boys of high school age could receive instruction in agriculture.

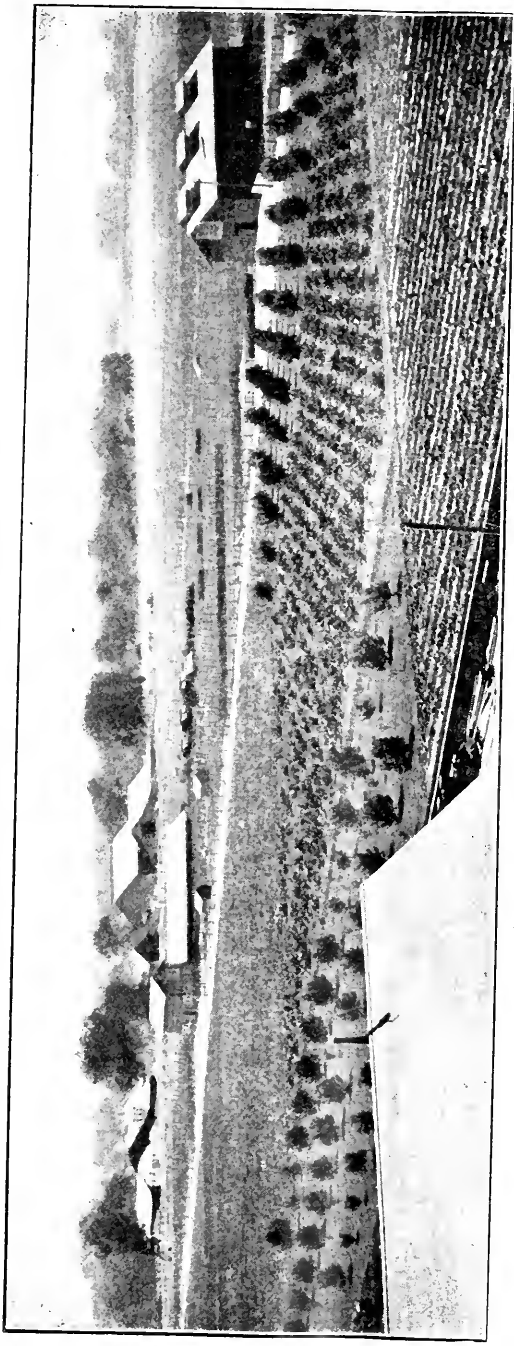
There were several reasons why this idea was abandoned:—

(1) It was considered that boys between fourteen and eighteen, *i.e.*, boys of high school, should sleep at home. It is an age when children are in special need of their parents.

A time comes when boys must break home ties. Experience indicates that eighteen or nineteen is the correct age for this to occur.

(2) The second reason for changing the age requirement at the University Farm Sschool is a desire to uphold the discipline of the high school, as well as to promote the teaching of agriculture in it.

To enter the University Farm School, a student must be eighteen years of age, unless he has graduated from a high school of recognised standing.



General View of the University Farm, Davis.

A study of the scholarship and conduct of the students of the University Farm School, covering two years, showed that the best students are those who have regularly graduated from a high school. The next best are those who have reached the age of eighteen without having been in a high school; while the least proficient in scholarship and most lacking in manly conduct are the students who have left the high school without completing the course.

(3) The third reason for the present procedure is the well-grounded belief that the important educational task in America to-day is to provide suitable training for the young men who have reached college age without having college requirements for entrance.

The University School is designed for the young man who has dropped out of the public school at some earlier period of life, but who, at the age of nineteen to twenty-two, discovers that he desires a training in agriculture.

While the primary purpose has been to reach the farm boy who has reached eighteen or over, and who, through no fault of his own, has failed to obtain a high school education, the facts are that the majority of men at the

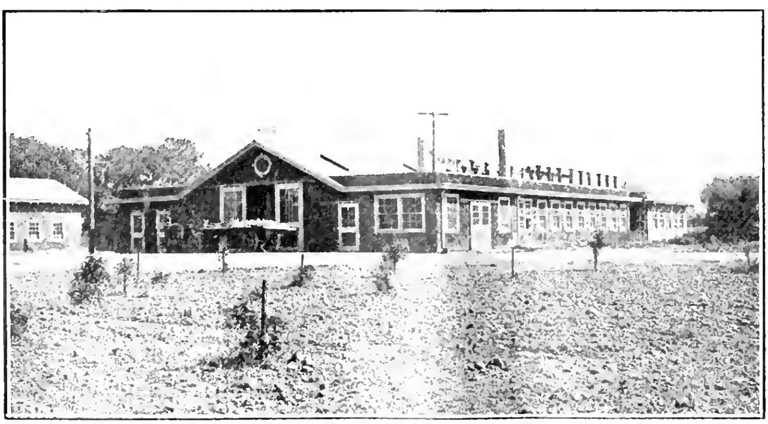
University Farm School are *graduates of high schools from city homes.*

The Difference between the Course at Berkeley and Davis.

The average age of the students at Davis is higher than that at Berkeley.

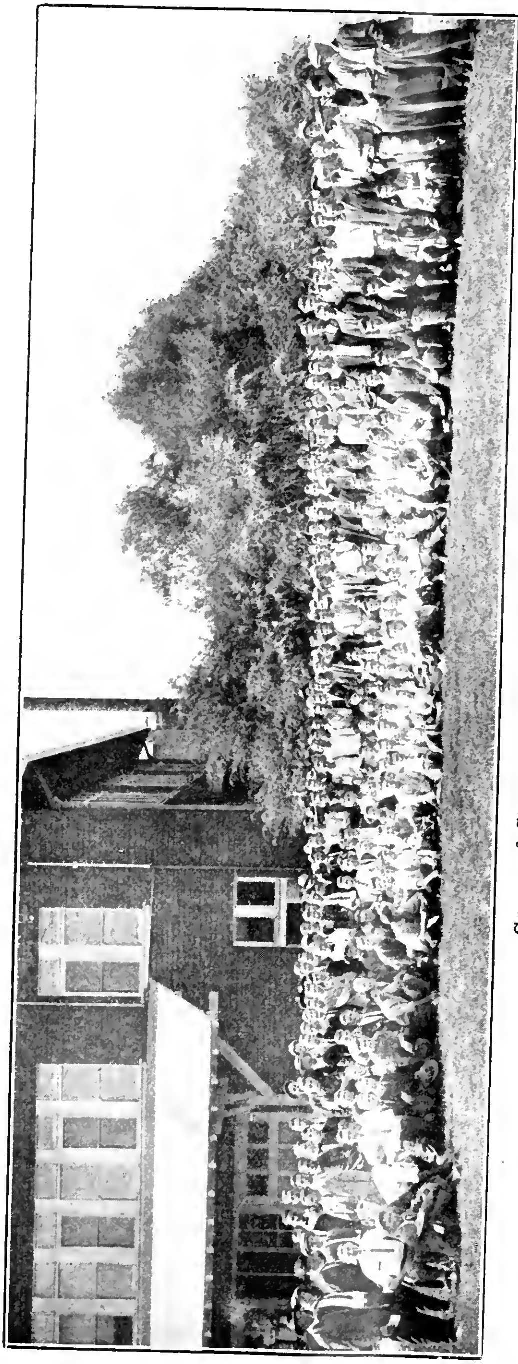
Horticultural Building, Davis Farm.

(The small building to the right is a garage for officers' automobiles.)



Farm Machinery Shops, University Farm, Davis.

(Here engines, motors, binders, drills, &c., of every make are taken to pieces and re-assembled by students for practice.)



Group of Students at University Farm, Davis.

Both the students at Berkeley and Davis are equally part of the University of California. The courses, however, are very different.

The course at Berkeley is for a degree, and students are required to put in four and a quarter years for graduation.

The courses at the Farm School require three years, but a graduate of a high school can complete them in two years.

A certificate, but no degree, is given on satisfactory completion of the course.

Every University student must acquire a real reading knowledge of some foreign language as a requirement for graduation.

No foreign language is required from University Farm School students.

A much more extended study of the underlying sciences is required of University students. The teaching of technical subjects to University Farm School students is somewhat modified, because in the difference in training of the underlying sciences, otherwise the instruction is much the same.

It was pointed out that the University course at Berkeley was a preparation for commercial and professional agriculture, for high school teaching, and for farm adviser work.

The University Farm School trains for the first

of these activities, but is not a preparation for the remainder.

(3) Extension Work of the University—Public Welfare.

Besides the resident instruction to undergraduates, the College of Agriculture carries out a large amount of extension work.

Indeed, the extension work is growing so rapidly in response to public demand that it will probably become the most important phase of University activity.

This extension work may be classed as—

(a) Correspondence courses.

(b) Farmers' institutes.

(c) County farm bureaux.

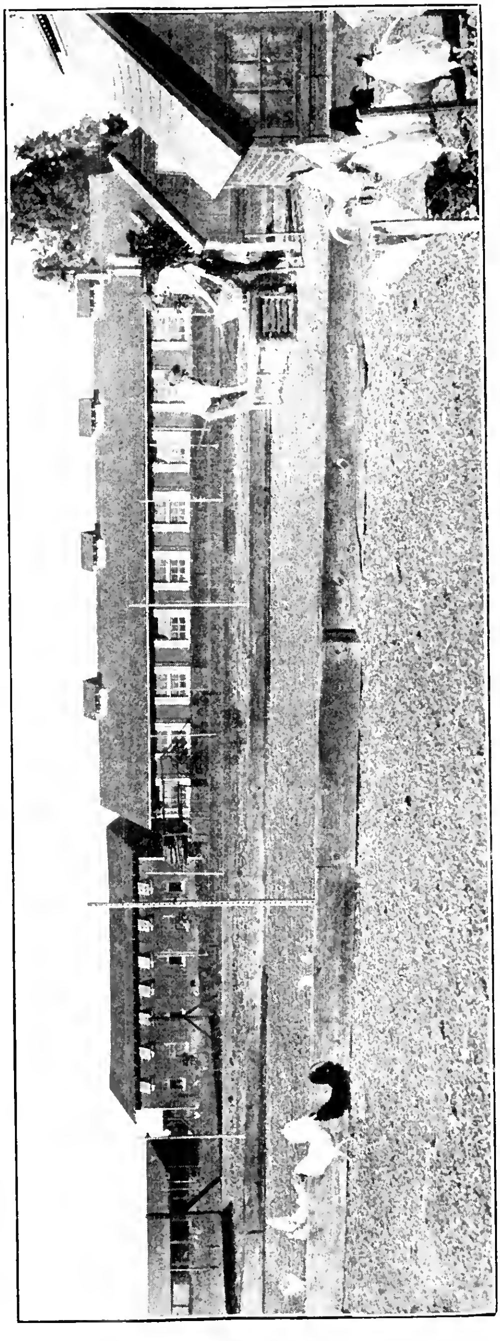
(d) Boys' high school clubs.

(e) Boys' public school clubs.

Correspondence Courses.

Twenty-two separate correspondence courses in agriculture were given at Berkeley.

Twenty-three thousand three hundred and seventy-four students were taking correspondence course during 1915. In the Correspondence School, 183,784 pieces of mail matter were distributed.

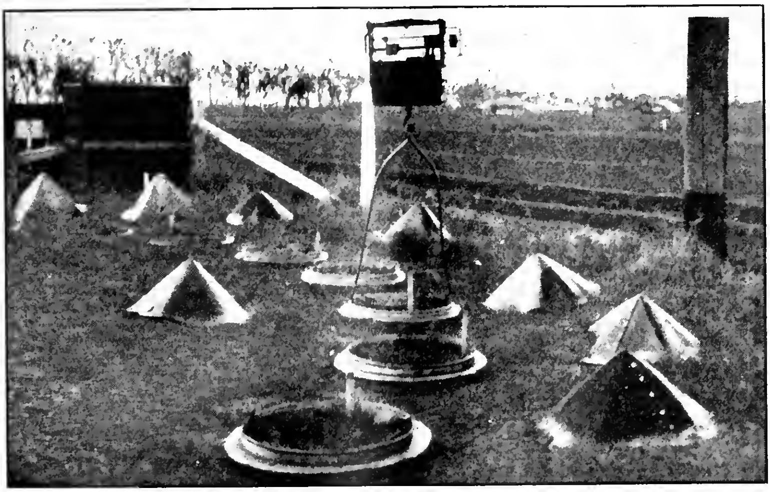


Poultry Division, University Farm, Davis.

The most popular courses were poultry husbandry, swine husbandry, alfalfa culture, dairy husbandry, and citrus culture, while the courses least sought were corn culture, beekeeping, and sheep husbandry.

In order to become students, it is necessary to fill out and return an application for the course desired. Two lessons are then sent to the applicant. Upon return of the first lesson, he is sent a third lesson, and so on to the end of the course.

The agricultural staff sent out 92,000 letters last year in answer to inquiries for specific information, apart from the regular correspondence courses.



Pot Experiments on the Duty of Water with Alfalfa.

(The pots are 4 feet deep, and hold half a ton of soil. They are raised by a crane, and weighed every Monday morning.)

Farmers' Institutes.

These are rapidly being replaced by the farm bureaux and the county adviser organization.

Any community that is not located in a farm adviser county may have a farmers' institute organized without charge on forwarding a guarantee that 25 to 50 farmers will attend the meetings.

Dean Hunt says that some people consider the college should hold meetings whether farmers desire them or not, on the ground that the people who need them most are those who desire them the least. His view is, however, that while the college will spare no pains to help any one who comes for legitimate help, it will not attempt to organize meetings without the request first comes from the farmers themselves.

(*To be continued.*)

GOVERNMENT CERTIFICATION OF STALLIONS.

ELEVENTH ANNUAL REPORT (SEASON 1917-1918).

By W. A. N. Robertson, B.V. Sc., Chief Veterinary Officer.

The number of stallions examined during the past year was lower than for any previous period, being only 237.

The main cause of this will probably be found in the slump in the price of horses; this has induced many to give up, or, at any rate, curtail the breeding of horses. A further reason for their decision has been the difficulty in obtaining reliable stud grooms, as so many have enlisted. The slump, however, is not likely to last—indeed, the prospect for the future is bright. The world-wide demand for foodstuffs that is bound to occur when the present upheaveal subsides and the peace of the world is once more established, will give a great impetus to settlement, and the demand for draught horses will cause the pendulum to swing back. Those who are prepared to supply the demand will reap a handsome reward for their labour, especially if breeding be carried on along sound lines. It is to be earnestly hoped that the reaction will not produce the same results as the boom of 1907 and 1908, and offer an inducement to keep as stallions animals of no breeding or type.

Although only 237 horses were examined during the season, the programme for the veterinary officers had to be mapped out so as to allow attendance at 80 parades. Only two veterinary officers being available, the time-table was arranged as in the previons year, providing for one officer to be in reserve all the time, and so available to keep appointments if there should be any alteration of train service or any unforeseen curtailment in arrangements. Owing to Mr. R. N. Johnstone's discharge from the Military Forces, there will be three officers available during the coming season, thus providing for two sets of parades a week; this will allow them all to be completed before the Royal Show.

As indicated in my last report, the examination of mares was introduced during the season under review. This step was taken in response to the request of breeders through the Royal Agricultural Society, this body having determined that only sound mares should be allowed to compete at their show. As many breeders were put to considerable expense and inconvenience in bringing animals to Melbourne to have them rejected by the Society's veterinary surgeon on the Show Grounds, they asked that Government officers, when examining stallions, should also examine mares which it was intended to enter in the Royal Show. Thus the examination of mares was confined to those entered in a stud book.

For the coming season the same conditions will apply, but, no doubt, when the members of the Veterinary Staff return from military service, the system will be extended to embrace all mares.

Thirty-three mares were submitted to Government inspection during the season, and six, or 18.1 per cent., were rejected for unsoundness—five on account of sidebone, and one for ringbone.

EXAMINATIONS AND REJECTIONS.

The percentage of stallions rejected for unsoundness shows a falling off on previous years, being the lowest on record, viz., 8.02, as against 11.25 per cent. last year, while 27 per cent. were rejected as being below standard, as against 30.9 last year. As in previous years, sidebone is still the main reason for rejection under the first heading, 9.92 per cent. being rejected for this unsoundness, as against 11.7 and 16.32 during 1916-17 and 1915-16 respectively. This is as was to be expected, and it is pleasing to find expectations being realized.

Ringbone was found in 1.65 per cent. draught horses, none being found in any other breed. This is a reduction from 3.72 per cent. last year. With the fluctuation in the total number examined, there is bound to be some swaying backwards and forwards of the percentage rejected, but the general downward trend is an indication that the work, so far as it goes, is having a beneficial effect.

The following table gives the details of the examinations for all horses:—

	Draughts.		Lights.		Ponies.		Totals (all Classes).	
—	Examined.	Certificated.	Examined.	Certificated.	Examined.	Certificated.	Examined.	Certificated.
	121	82	84	52	32	20	237	154
	Rejected.	Per cent. Rejected.	Rejected.	Per cent. Rejected.	Rejected.	Per cent. Rejected.	Rejected.	Per cent. Rejected.
Bog Spavin .	..	...	...	..	...	...	...	...
Bone Spavin	...	.	2	2·38	1	3 12	3	1·26
Cataract ...	...	...	...	...	...	...	...	...
Chorea ..	...		...	...	...	...	...	...
Curb ...	...	...	1	1.19	.	..	1	·42
Navicular Disease	...	...	...	...	...	...	...	...
Nasal Disease	...	..	...	...	...	...	..	...
Ringbone ...	2	1·65	...	...	...	...	2	·84
Roaring ...	...	..	...	...	...	...		...
Sidebone ...	12	9·92		...	...	..	12	5·06
Stringhalt ...	...	..	...	...	1	3·12	1	·42
Thoroughpin	..	..	...	...	...	..	...	...
Whistling ...	...	...	..	..	...	...	...	...
Total unsoundness ...	14	11·57	3	3 57	2	6 25	19	8 02
Disapproved	25	20·66	29	34·52	10	31·25	64	27·00
Total rejected	39	32·23	32	38·09	12	37·50	83	35·02

Horses Re-submitted for Examination.

Seventy-seven horses which had been previously certificated were submitted for further inspection, and the result of the examination is as under:—

Horses Submitted for Renewal of Certificates, 1917-1918.

Reason for Rejection.	3 years.		4 years.		5 years.		Totals.	
	Examined. 1	Certificated. 1	Examined. 26	Certificated. 22	Examined. 50	Certificated. 40	Examined. 77	Certificated. 63
	Rejected.	Per cent. Rejected.	Rejected.	Per cent. Rejected.	Rejected.	Per cent. Rejected.	Rejected.	Per cent. Rejected.
Disapproval	..	..	2	7·69	6	12·0	8	10·39
Sidebone ..	..	..	2	7·69	2	4·0	4	5·19
Ringbone ..	..	..	..	..	2	4·0	2	2·60
Curb ..	..	..	..	..	..	..	..	..
Spavin ..	..	..	..	..	..	..	..	..
Roaring ..	..	..	..	..	..	..	..	..
Cataract ..	..	..	..	..	..	..	..	..
Total ..	..	..	4	15·38	10	20·0	14	18·18

Here, also, there is a slight falling off in the percentage of those refused certificates. In 1916, 13.4 per cent. were rejected for unsoundness developed after three years of age, and last year only 7.7 were found so affected.

Transferred Certificates.

The number of certificates presented for transfer to Victorian certificates was:—New Zealand, 7; New South Wales, 4; while one from New South Wales was indorsed as being eligible for Victorian shows.

Appeals.

Only two appeals were lodged against the refusal of certificates, and both were in respect of light horses, on the question of being below reasonable standard. The Board appointed by the Hon. the Minister upheld the action of the veterinary officer, and refused certificates.

The following table shows the number of horses examined by each veterinary officer. It will be noted that, contrary to custom, I conducted two examinations myself. These were made in response to earnest appeals by owners when no other officer was avaliable:—

Name of Officer.	Number Examined.	Number Certificated.	Number Rejected.	Percentage Rejected.
Mr. R. Griffin, M.R.C.V.S.	111	63	48	43·24
Mr. W. M. Lerew, G.M.V.C. ...	121	88	33	27·27
Mr. W. A. N. Robertson, B.V. Sc. ...	2	2	...	...
Mr. R. N. Johnstone, B.V. Sc. ...	1	1	...	..
Appeal Boards	2	...	2	100·00

A summary of the eleven years' work is given on the next page.

Summary of Ten Years' Work, 1907–1918

Season.	Draughts. Examined.	Draughts. Certificated.	Draughts. Rejected.		Draughts. Percentage.	Lights. Examined.	Lights. Certificated.	Lights. Rejected.		Lights. Percentage.	Ponies. Examined.	Ponies. Certificated.	Ponies. Rejected.		Ponies. Percentage.	Totals. Examined.	Totals. Certificated.	Totals. Rejected.		Totals. Percentage.
1907–8 and 1908–9	904	612	Unsound	233	51·15	596	488	Unsound	61	20·46	413	345	Unsound	15	7·17	1,913	1,415	Unsound ..	309	32·21
			Disapproved	59	13·52			Disapproved	47	15·77			Disapproved	53	25·99			Disapproved	159	16·62
				292	64·67				108	36·23				68	33·16				468	48·83
1909–10 ..	410	275	Unsound	96	23·52	191	147	Unsound	12	6·27	156	112	Unsound	5	3·29	757	534	Unsound ..	113	15·04
			Disapproved	39	9·56			Disapproved	32	16·77			Disapproved	39	25·65			Disapproved	110	14·65
				135	33·08				44	23·04				44	28·94				223	29·69
1910–11 ..	542	387	Unsound	117	21·57	143	108	Unsound	15	10·53	128	101	Unsound	7	5·47	813	596	Unsound ..	139	17·09
			Disapproved	38	7·01			Disapproved	20	14·08			Disapproved	20	15·62			Disapproved	78	9·6
				155	28·58				35	24·61				27	21·09				217	26·69
1911–12 .	692	554	Unsound	84	12·13	165	120	Unsound	13	7·87	122	83	Unsound	5	4·09	979	758	Unsound ..	102	10·42
			Disapproved	54	7·8			Disapproved	31	18·78			Disapproved	34	27·86			Disapproved	119	12·15
				138	19·94				44	26·66				39	31·96				221	22·57
1912–13 ..	745	597	Unsound	89	12·03	139	106	Unsound	19	13·67	70	43	Unsound	2	2·85	954	746	Unsound ..	110	11·59
			Disapproved	59	7·92			Disapproved	14	10·07			Disapproved	25	35·71			Disapproved	98	10·27
				148	19·73				33	23·74				27	38·57				208	21·81
1913–14 ..	718	507	Unsound	79	11·0	157	102	Unsound	16	10·19	88	60	Unsound	5	5·68	963	669	Unsound	100	10·38
			Disapproved	132	18·38			Disapproved	39	24·84			Disapproved	23	26·14			Disapproved	194	20·14
				211	29·39				55	35·03				28	31·82				294	30·53
1914–15 ..	400	267	Unsound	62	15·50	121	75	Unsound	14	11·57	82	55	Unsound	7	8·53	603	397	Unsound ..	83	13·76
			Disapproved	71	17.75			Disapproved	32	26·44			Disapproved	20	24·39			Disapproved	123	20·40
				133	33·25				46	38·01				27	32·92				206	34·16
1915–16 ..	239	144	Unsound	47	19·67	71	48	Unsound	5	7·04	45	28	Unsound	1	2·22	355	220	Unsound	53	14·93
			Disapproved	48	20·08			Disapproved	18	25·35			Disapproved	16	35·55			Disapproved	82	23·10
				95	39·75				23	32·39				17	37·77				135	38·03
1916–17 ..	188	166	Unsound	31	16·49	79	40	Unsound	3	3.80	53	29	Unsound	2	3·77	320	185	Unsound	36	11.25
			Disapproved	41	21·81			Disapproved	36	45.57			Disapproved	22	41·51			Disapproved	99	30.94
				72	38·30				39	49.37				24	45·28				135	42.19
1917–18 ..	121	82	Unsound	14	11·57	84	52	Unsound	3	3·57	32	20	Unsound	2	6·25	237	154	Unsound ..	19	8·02
			Disapproved	25	20·66			Disapproved	29	34·52			Disapproved	10	31·25			Disapproved	64	27·00
				39	32·23				32	38·09				12	37·50				83	35·02

REGULATIONS

Governing the Examination of Stallions and Mares for the Government Certificate of Soundness and Approval.

I.—Examination Parades.

(1) Societies within whose district an Inspection Parade is appointed are required to provide a suitable place for the examinations to be conducted, and to suitably and reasonably advertise the holding of the parade on receipt of notice from the Department of the fixture. The secretary or some member of the committee of the society is required to be in attendance at the appointed time to assist the examining officer in the arrangements for the inspection.

(2) The Parades will be conducted and the Veterinary Officer will attend without expense to Societies other than that involved in advertising and making known the occasion to the public and the horse-owners in the district, and providing the examination ground.

(3) The Examining Officer will attend Inspection Parades held at times and places set out in the official Time Table for the year, and all examinations for the Government Certificate will be made at such Parades or on some such publicly advertised occasion, *unless* under special circumstances as provided for in clause 5.

(4) In the event of it being found impossible for local reasons to hold the Parade in any district at the time and date set out in the Time Table, notice to that effect—together with suggestions for alternative date and time compatible with the rest of the Time Table—should be given *not later than 1st June,* after which no alteration in the Time Table can be made.

(5) The special examination of horses for the Government Certificate of Soundness at other than the advertised parades may be arranged for in cases where, through accidental circumstances, the owner has failed to submit the horse at such parade.

Such examinations will only be arranged when the attendance of the Examining Officer will not interfere with the requirements of the Department for his services in other directions.

An owner requesting such special examinations will be required to prepay a fee of £1 1s. for each horse examined; also the railway fare (first class return), and travelling expenses at the rate of 14s. per day, of the visiting officer.

II.—Grounds for Rejection.

(1) Refusal of Certificate on the ground of unsoundness will be made only when, in the opinion of the Examining Officer, the horse is affected at the time of examination with one or more of the following hereditary unsoundnesses, viz.:—

Bog Spavin	Ringbone
Bone Spavin	Roaring
Cataract	Sidebone
Chorea "Shivering" or "Nervy"	Stringhalt
Curb	Thoroughpin
Navicular disease	Whistling
Nasal disease (Osteo-porosis)	

or such other hereditary unsoundness as the Minister may at any time declare. (Blemishes or unsoundness, the result—in the opinion of

the Examining Officer on appearances then presented—of accident, injury, and over-strain or over-work, will not disqualify.)

(2) For the purpose of these regulations the following shall be the definitions of "Ringbone," "Sidebone," and "Curb":—

(*a*) Any exostosis on the antero or lateral aspect of the phalanges below the upper third of the *Os Suffraginis* shall constitute a Ringbone;

(*b*) Any ossification of the lateral cartilage shall constitute a Sidebone;

(*c*) Any circumscribed swelling on the posterior aspect of the hock in the median line and within the limits of the lower third of the hock and the head of the metatarsal bones shall constitute a Curb.

(3) The Certificate will also be refused in the case of animals considered by the Examining Officer to be below a reasonable standard for Government approval, as regards type, conformation, and breeding.

(4) Horses three or four years old, which are refused a Certificate as regards type, conformation, and breeding may be re-submitted annually until five years old, after which the refusal shall be subject to review under Part V. of these regulations only.

(5) In the case of horses that have been rejected for any reason whatsoever, a notification containing all particulars of identification shall be sent to all Chief Veterinary Officers of the other States of the Commonwealth as early as practicable after such examination has taken place.

III.—Certificates.

(1) Particulars concerning the identity of the horse—name, breeder, pedigree, age, prior ownership, &c.—must be furnished to the Examining Officer at the time of examination. If deemed necessary in any case the owner may be called upon to furnish a statutory declaration as to the correctness of such particulars.

(2) Certificates will be issued within seven days of the holding of the Parades, and will be forwarded to the owner direct. Secretaries of Societies under whose auspices the Parade is held will be notified which, if any, of the horses submitted for examination obtain their Certificates.

(3) The owners of horses for which a Certificate is refused will within seven days of such refusal be officially notified of the fact; the reason for such rejection will also be given.

(4) Until the issue of a Certificate, or until the publication of the official list of certificated stallions and mares, the result of the Veterinary examination will not be communicated to any person except as herein provided or under circumstances as follow:—The Examining Officer may, on request on proper occasion, communicate to the owner or his agent—duly authorized in writing to inquire—the result of the examination. In case of refusal of the Certificate the reasons for refusal will not under any circumstances, save in legal proceedings under the direction of the Court, be communicated to any person except the owner or his agent duly authorized in writing. Secretaries of Societies, persons in charge of the horse, grooms or relatives of the owner will not be considered authorized agents for that purpose unless

they deliver to the officer the owner's signed authority to receive the information.

(5) The Victorian Government Certificate of Soundness can only be issued in respect of horses three years old and over, that have been examined by a Victorian Government Veterinary Officer, or horses in respect of which any of the following certificates are produced:—

The Government Certificate of Soundness of any Australian State or New Zealand.

The Veterinary Certificate of the Royal Shire Horse Society (England).

The Veterinary Certificate of Royal Agricultural Society (England).

The Veterinary Certificate of Royal Dublin Society (Ireland).

The Veterinary Certificate of Highland and Agricultural Society (Scotland).

The Veterinary Certificate of Glasgow and West of Scotland Agricultural Society.

The Veterinary Certificate of the Board of Agriculture and Fisheries (England).

The Veterinary Certificate of the Board of Agriculture (Scotland).

Provided that such horses have been examined in accordance with these regulations.

Any horse which has been rejected by the Veterinary Examiners for any of the above certificates will not be eligible for examination for the Victorian Government Certificate of Soundness.

(6) The form of the Victorian Government Certificate of Soundness is as follows:—"G.R.—Department of Agriculture, Victoria, No. . Certificate of Soundness and Approval, issued for the season (*or issued for Life as the case may be*), given in respect of the (*breed*) stallion or mare (*name and description of stallion or mare*) submitted for Government inspection by the owner (*name of owner*) at (*place of examination*) such horse having been found suitable for stud service and free from hereditary unsoundness and defects of conformation predisposing thereto on examination by (*signature of Examining Officer*) Veterinary Officer on the day of 19 .

(Signature).

Chief Veterinary Officer.

Issued by direction of the Minister of Agriculture.

(Signature).

Director of Agriculture."

(7) Two-year-old colts may be submitted for examination and a temporary certificate will be issued in respect of such as pass the examination. Such temporary certificate must not be taken to imply suitability for stud service of approval as regards type, nor is the issue of it intended as an indication of the likelihood of a certificate being issued when submitted for examination at a more mature age.

(8) The season in respect of Government Certificates shall be considered as opening on 1st July. Horses passing the examination any

time during the three months previous to this date in New Zealand or Australia will be granted a Certificate for the season next following. In respect of horses examined in Great Britain examinations on or after 1st January will be considered as examinations for the following season.

(9) In the event of a Certificate issued to any owner being lost such owner may, on production of satisfactory evidence supported by statutory declaration, obtain the issue of a duplicate thereof on payment of a fee of £1 1s.

IV.—Tenure of Certificate.

(1) Certificates issued during the season in respect of horses five years old and over are life certificates; those for three-year-olds and four-year-olds are season certificates only, and such horses must be submitted for re-examination at four and five years before a life certificate will be issued.

(2) The Season certificate issued in respect of any horse must be handed to the Examining Officer at the time of re-examination or forwarded to the Chief Veterinary Officer before a subsequent Season certificate or a Life certificate will be issued.

(3) The Minister retains the right to at any time have a certificated horse submitted for re-examination, and to withdraw the certificate, in the event of the animal being declared, to his satisfaction, unsound.

V.—Board of Appeal.

(1) Any owner of a stallion or mare who is dissatisfied with the refusal of a Government certificate in respect of his horse may appeal against the decision to the Minister at any time within *thirty* days of the examination, under the following conditions:—

(*a*) That the appeal be in writing and be accompanied by the lodgment of £5, such amount to be forfeited in the event of the appeal *not* being upheld, unless the Board shall for good cause otherwise direct.

(*b*) That the appeal be accompanied by an undertaking to pay any railway fares and hotel expenses incurred by the Board of Appeal in connexion with the settlement of the appeal.

(*c*) That, in the event of refusal having been on the ground of unsoundness, the appeal be accompanied by a certificate from a registered Veterinary Surgeon setting out that the horse has been found by him on examination since the refusal appealed against to be free from all the unsoundnesses set out in Part II. of these regulations.

(*d*) That, in the event of refusal having been on the ground of being below standard for Government approval, the appeal be accompanied by a certificate from the President and two members of the Committee of the Society under whose auspices the parade was held, setting out that in their opinion the horse is of fit and proper type, conformation, and breeding to be approved as a stud horse.

(2) On receipt of Notice of Appeal in proper form, and with the above conditions complied with, the Minister will appoint a Board of Appeal, which shall consist of:—

(*a*) In the case of appeals against refusal of certificate on the ground of unsoundness, the Chief Veterinary Officer and two practising Veterinary Surgeons.

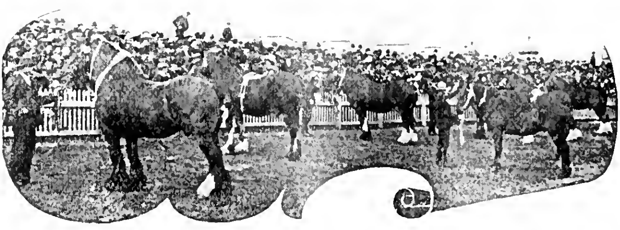
(*b*) In the case of appeals against refusal of certificate as being below standard for Government approval, the Chief Veterinary Officer and two horsemen of repute and standing.

Such Board shall act and decide on the appeal, and its decision shall be final, and *not subject to review.*

(3) In the event of the appeal being allowed, refund shall be made of the deposit and any expenses paid by the appellant under Clause 1 (*b*). Further, the Board may recommend to the Minister the allowance of such of the expenses of the appellant in supporting his appeal as it may consider reasonable under the circumstances of the case, and the Minister may, in his discretion, confirm the recommendation in whole or in part, whereupon allowance shall be made to the appellant accordingly.

(4) No horse in respect of which a Government certificate is refused will be allowed to be re-submitted for examination except in the case of an appeal or in such case as when a three or four years old horse has been refused on account of type as herein provided for. In the event of any rejected horse being re-submitted for examination under another name or under such circumstances as in the opinion of the Minister are calculated to mislead the Examining Officer into the belief that the horse has not previously been examined, the owner of such rejected horse, if proved to the satisfaction of the Minister that he is responsible for such re-submission, shall be debarred from submitting any horse for examination for such period as the Minister shall determine.

(5) In these regulations the words "stallion" or "horse" shall, unless the context clearly indicates to the contrary, be taken to mean either stallion or mare or animal of either sex, provided that in respect of mares only those which are registered in a recognised Stud Book for Draught Horses shall be examined.



SUPPLEMENTARY LIST OF LIFE CERTIFICATED STALLIONS.

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date of Examination.	Officer.
			DRAUGHTS.			
3040	Abbott's Best ..	5 years	J. Egan ..	Mansfield ..	13.9.17	W.M.L.
3060	Abbotsford Champion	5 years	C. Elphick ..	Foster	10.10.17	W.M.L.
3058	Baron Alexander..	5 years	R. N. Scott ..	Korumburra ..	5.10.17	R.G.
3047	Baron Carlyle ..	5 years	Gillies and Walter	New South Wales Exam.	1.4.17	..
3059	Baron Ramsay ..	5 years	J. Harry and Sons	Dingie Special ..	8.10.17	R.G.
3022	Baron's Reserve ..	5 years	R. Bushby ..	Jeparit	17.8.17	R.G.
3042	Belmont's Champion	5 years	Turner Bros. ..	Mernda ..	17.9.17	W.M.L.
3000	Black Sam ..	6 years	Mitchell and O'Brien	Royal Show Grounds	24.7.17	R.G.
3064	Bold Marquis ..	5 years	E. Wright and Son	Royal Show ..	24.9.17	R.G.
3024	Bonny Percy ..	5 years	A. Williams ..	Nhill	15.8.17	R.G.
3027	Colonel Dale ..	5 years	T. F. Major ..	Kerang	28.8.17	R.G.
3015	General Kitchener..	5 years	D. Marshman ..	Beulah	9.8.17	W.M.L.
3002	Glencoe	5 years	G. Wright ..	Royal Show Grounds	24.7.17	R.G.
3003	Kilmarnock ..	Aged	J. and G. W. Badman	Royal Show Grounds	24.7.17	R.G.
3031	King's Pride ..	Aged	G. T. Hill ..	Benalla ..	5.9.17	W.M.L.
3007	Lee Creek Squire ..	5 years	W. Underwood ..	Colac	3.8.17	R.G.
3038	Livingstone ..	Aged	A. C. Petrass ..	Kyabram ..	11.9.17	W.M.L.
3041	Loyalty	5 years	A. Thompson ..	Werribee ..	15.9.17	W.M.L.
2999	Moira Commodore..	Aged	Jno. E. Pifkie ..	Royal Show Grounds	24.7.17	W.M.L.
3035	Onward's Star ..	5 years	T. R. W. Powles ..	Shepparton ..	11.9.17	R.G.
3033	Pesha	5 years	Chas. Mason ..	Warracknabeal ..	8.8.17	W.M.L.
3030	Pride of the North	5 years	D. Blair ..	Charlton ..	31.8.17	R.G.
3023	Queen's First ..	5 years	P. Müller ..	Dimboola ..	16.8.17	R.G.
3043	Royal Belmont ..	5 years	Turner Bros. ..	Mernda ..	17.9.17	W.M.L.
3018	Royal Colours ..	5 years	A. D. Hiscock ..	Warracknabeal ..	8.8.17	W.M.L.
2991	Royal Treasure ..	Aged	Wm. Thompson ..	N. Z. Exam. ..	5.3.17	..
3054	Scotty	5 years	A. McDonald ..	Rochester ..	2.10.17	W.M.L.
3046	Sir Roderick ..	Aged	W. Byrne ..	Kyneton ..	18.9.17	W.M.L.
3048	Sir William ..	5 years	W. McClellan ..	Ballarat ..	21.9.17	R.G.
3057	The Factor ..	Aged	Mitchell and O'Brien	Wickliffe Special ..	5.10.17	W.M.L.
2998	Tulchan Gem ..	Aged	W. Crosbie ..	Mildura ..	17.7.17	W.M.L.
			LIGHT HORSES			
3065	Aberdeen ..	5 years	J. Troup ..	Public Offices ..	17.11.17	R.G.
2996	Al Borak ..	5 years	T. McCarthy ..	Mildura ..	17.7.17	W.M.L.
3034	Bob Ash ..	5 years	T. Moore ..	Shepparton ..	11.9.17	R.G.
2997	Bonnie Direct ..	5 years	W. T. Taylor ..	Mildura	17.7.17	W.M.L.
3072	Breakfoot ..	Aged	L. McRae ...	Public Offices Special	13.2.18	W.M.L.
1567, N.S.W.	Cannonier ..	..	C. H. Wente ..	New South Wales Exam.	23.8.10	..
3056	Captain Llewellin ..	6 years	G. Buckley ..	Wickliffe Special Exam.	5.10.17	W.M.L.
3006	Cleve Bells ..	Aged	J. J. Kennedy ..	Public Offices ..	4.8.17	W.M.L.
3021	Dixie Boodle ..	5 years	C. Zimmer ..	Public Offices ..	18.8.17	W.M.L.
3061	First Aid.. ..	5 years	Geo. Collis ..	Yarram ..	11.10.17	W.M.L.
3036	Golden Wood ..	Aged	J. T. Ovens ..	Kyabram ..	11.9.17	W.M.L.
3055	Goodwood ..	..	R. Loseby ..	New South Wales Exam.	28.7.13	..
3050	Gospel Bells ..	5 years	G. H. Alford ..	Royal Show ..	24.9.17	R.G.
2992	Grattan Again ..	5 years	W. J. Parish ..	Horsham ..	11.7.17	W.M.L.
3037	Honest Mac ..	5 years	J. H. Hunt ..	Kyabram ..	11.9.17	W.M.L.
2990	Leonard	5 years	P. V. Frauenfelder	Public Offices ..	7.6.17	W.M.L.
3066	Lord Panic ..	Aged	Callan Bros. ..	Public Offices ..	17.11.17	R.G.
3028	Merrimu	5 years	G. M. Valtence ..	Kerang	28.8.17	R.G.
3062	Muskaloon ..	5 years	C. Barlow ..	Yarram ..	11.10.17	W.M.L.
3053	Musket Bells ..	5 years	R. Sandilands ..	Kyneton ..	18.9.17	W.M.L.
3063	Orient	6 years	W. J. Loh ..	Yarram ..	11.10.17	W.M.L.
3051	Oscar Asche ..	5 years	E. Partridge ..	Royal Show ..	24.9.17	W.M.L.
3068	Osterlater ..	5 years	G. Cross ..	Maffra Special Exam.	20.11.17	R.G.
3044	Premarvel ..	Aged	M. J. Dean ..	Public Offices ..	8.9.17	W.M.L.

Supplementary List of Life Certificated Stallions—*continued.*

Cert. No.	Name of Horse.	Age.	Owner.	Parade.	Date of Examination.	Officer.
	Light Horses—*continued.*					
3013	Prince Binnia ..	Aged	R. Harnath and Sons	Hamilton ..	1.8.17	R.G.
3029	Rival Loch ..	Aged	R. M. Thomas ..	Swan Hill ..	29.8.17	R.G.
3052	Shandon Bells ..	6 years	G. H. Alford ..	Royal Show ..	24.9.17	R.G.
3014	Shandon Bells ..	5 years	H. C. H. Hately ..	Murtoa	10.8.17	W.M.L.
2995	Sir Iver	5 years	J. Commini ..	Horsham ..	11.7.17	W.M.L.
3073	Sunny Voyage ..	6 years	V. R. Anderson ..	Trafalgar ..	4.3.17	R.N.J.
2994	The Butler ..	5 years	A. H. Siemering ..	Horsham ..	11.7.17	W.M.L.
	Ponies.					
3026	Badaween's Pride ..	5 years	F. O'Donnell ..	St. Arnaud ..	22.8.17	W.M.L.
3045	Berkeley Swell ..	5 years	D. J. Reen ..	Kyneton ..	18.9.17	W.M.L.
3004	Black Imp ..	5 years	Orton Bros. ..	Public Offices ..	28.7.17	W.M.L.
3008	Federation ..	6 years	B. Rogers ..	Warrnambool ..	2.8.17	R.G.
3010	Happy Jack ..	Aged	J. B. Atchison ..	Koroit	2.8.17	R.G.
3069	Perfection ..	Aged	W. Horswood ..	Emerald Special ..	22.11.17	W.M.L.
3009	Prefix	Aged	R. A. Affleck ..	Warrnambool ..	2.8.17	R.G.
3011	Rhymney II. ..	5 years	C. Gorman ..	Koroit	2.8.17	R.G.
3071	What Oh ..	Aged	W. Willmott ..	Dandenong Special	30.1.18	W.M.L.
	Thoroughbreds.					
3049	Burrawang ..	Aged	E. S. Wragge ..	Royal Show ..	24.9.17	R.G.
3001	Cacique	Aged	G. A. Maxwell ..	Royal Show Grounds	24.7.17	W.M.L.
3016	Crown Steel ..	6 years	O. J. Coghlan ..	Minyip	9.8.17	W.M.L.
3039	Hayston	6 years	P. Donohue ..	Tatura	11.9.17	W.M.L.
2993	Lord Pilatus ..	5 years	C. A. Fartch ..	Horsham ..	11.7.17	W.M.L.
3032	Mainstitch ..	Aged	R. W. Story ..	Euroa	6.9.17	W.M.L.
3012	Scotch Spirit ..	6 years	D. Cuthbert ..	Camperdown ..	3.8.17	R.G.
3019	Suggestion ..	5 years	A. Cameron ..	Warracknabeal ..	8.8.17	W.M.L.
3020	Trusty Servant ..	6 years	A. E. Davis ..	Warracknabeal ..	8.8.17	W.M.L.
3025	Windlesham ..	6 years	J. Ferguson ..	Nhill	15.8.17	R.G.
3067	Yenela	Aged	D. A. Hutchison ..	Yan Yean Special	19.11.17	R.G.

LIST OF TERMINABLE CERTIFICATED STALLIONS.

(Four-year-old Certificates expiring 30th June, 1918.)

Cert. No.	Name of Horse.	Owner.	Parade.	Date of Examination.	Officer.
	Draughts.				
1147/4	Abbotsford Len ..	P. Rogers ..	New Zealand Exam. ..	11.6.17	..
1146/4	Abbotsford Ronald ..	Mitchell and O'Brien	New Zealand Exam. ..	11.6.17	..
1177/4	Baron Fenwick ..	S. J. Lynn ..	Orbost	23.10.17	R.G.
1165/4	Belmain	G. Williams ..	Shepparton	11.9.17	R.G.
1149/4	Bold Newton ..	J. R. Mitchell ..	Casterton	31.7.17	R.G
1143/4	Claymore	A. F. Cullen ..	Royal Show Grounds ..	24.7.17	R.G.
1167/4	Commander	T. Coldwell ..	Shepparton	11.9.17	R.G.
1171/4	Field Marshal ..	G. and W. Lord ..	Royal Show	24.9.17	W.M.L.
1151/4	Gisborne	W. E. Millstead ..	Hopetoun	9.8.17	W.M.L.
1148/4	High Commander ..	Mitchell and O'Brien	New Zealand Exam. ..	11.6.17	..
1173/4	Hillhead Knight ..	W. Black	Royal Show ..	24.9.17	W.M.L.
1144/4	Ivan Dale	Collins Bros. ..	Royal Show Grounds ..	24.7.17	R.G.
1161/4	King of Ury Park ..	W. Hicks	Kaniva	14.8.17	R.G.
1152/4	Lord Salisbury ..	A. McRae ..	Minyip	9.8.17	W.M.L.
1170/4	Magician	W. J. Williams ..	Korumburra	5.10.17	R.G.
1163/4	Major Dale	F. J. Edwards ..	Charlton	31.8.17	R.G.

List of Terminable Certificated Stallions—*continued.*

Cert. No.	Name of Horse.	Owner.	Parade.	Date of Examination.	Officer.
			Draughts—*continued.*		
1142/4	Noble Knight..	Mitchell and O'Brien	Horsham	11.7.17	W.M.L.
1154/4	Northern Chief	H. E. Hut..	Rainbow	7.8.17	W.M.L.
1145/4	Ormond Dale	Letcher Bros.	Royal Show Grounds..	24.7.17	W.M.L.
1168/4	Prince Coupar	J. Archibald	Kyabram	11.9.17	W.M.L.
1141/4	Royal Charm	A. J. Thompson	Horsham	11.7.17	W.M.L.
1166/4	Royal Douglas	T. Thornton	Numurkah	10.9.17	R.G.
1159/4	Royal Harp	Kelm Bros.	Dimboola	16.8.17	R.G.
1176/4	Royal Milton	W. Long, senr.	Foster	10.10.17	W.M.L.
1178/4	Royal Robin	J. Boyle	Boort	31.10.17	W.M.L.
1160/4	Royal Willie	F. W. Saltman	Dimboola	16.8.17	R.G.
1150/4	St. Mark	F. W. Marshman	Beulah	9.8.17	W.M.L.
1138/4	Waiheno Elector	J. O'Brien..	New Zealand Exam.	28.5.17	..
			LIGHT HORSES.		
1153/4	Akabah	A. Cameron	Warracknabeal	8.8.17	W.M.L.
1155/4	Epicure	Dr. Henderson	Wangaratta..	15.8.17	W.M.L.
1179/4	Flash Dillon	J. S. Ford	Bacchus Marsh	31.10.17	W.R.
1156/4	Napar	E. Tozer	Wangaratta..	15.8.17	W.M.L.
1158/4	Plumlea	P. Fischer	Jeparit	17.8.17	R.G.
1140/4	Robin Roy	J. Scott	Public Offices	7.7.17	W.M.L.
			PONIES.		
1139/4	Dandy Shine..	E. Boddington	Public Offices	7.7.17	W.M.L.
1172/4	Hermes of Shetland Heights	Mrs. J. MacLellan..	Royal Show	24.9.17	W.M.L.
1174/4	Sandow's Pride	C. E. Gladman	Royal Show	24.9.17	W.M.L.
1164/4	Silver King	G. Pyers	Charlton	31.8.17	R.G.
1162/4	Young Badaween	T. Morley..	St. Arnaud	22.8.17	W.M.L.
1175/4	Young Comet..	T. Atkins	Korumburra..	5.10.17	R.G.
			THOROUGHBREDS.		
1169/4	Several	J. Boyd	Public Offices	8.9.17	W.M.L.
1157/4	Vascara	F. Hoysted	Wangaratta	15.8.17	W.M.L.

(Three-year-old Certificates expiring 30th June, 1918)

DRAUGHTS.

Cert. No.	Name of Horse.	Owner.	Parade.	Date of Examination.	Officer.
1841/3	Baron Clyde	G. T. Chirnside	Werribee Special Exam.	4.9.17	R.G.
1823/3	Bessboro' Baron	J. and G. W. Badman	Royal Show Grounds..	24.7.17	W.M.L.
1719/3	Bold Agitation	W. Cumming	Public Offices	14.7.17	R.G.
1822/3	Bold Alexander	G. H. Hart	Public Offices	17.7.17	W.R.
1821/3	Bonnie Brae	King Bros.	Public Offices	14.7.17	R.G.
1837/3	Brestknot	W. J. Moll	New South Wales Exam.	29.3.17	..
1833/3	Brethorn	A. L. Elsom	Dimboola	16.8.17	R.G.
1842/3	Bute Laddie	Crawford Bros.	Werribee Special Exam.	4.9.17	R.G.
1718/3	Dunsmore Ranger	W. T. Bodey	Horsham	11.7.17	W.M.L.
1820/3	Earl Talbot	G. H. Hart	Public Offices	14.7.17	R.G.
1827/3	General Harvey	Koscityke Bros.	New Zealand Exam.	11.6.17	..
1826/3	General Keith	P. J. Nunan	New Zealand Exam.	11.6.17	..
1840/3	Grand March	H. Carr	Charlton	31.8.17	R.G.
1838/3	Ian McClelland	H. Naylor	Ararat	28.8.17	W.M.L.
1824/3	King Cole	Forsyth Bros.	Royal Show Grounds	24.7.17	W.M.L.
1843/3	Kitchener	Dookie Agricultural College	New South Wales Exam.	29.3.17	..
1828/3	Lord Simon	Mitchell and O'Brien	Public Offices	28.7.17	W.M.L.
1834/3	Nailstone Fancy	J. P. Manning	Nhill	15.8.17	R.G.
1844/3	Prime Minister	W. H. Harrison	Rutherglen	3.9.17	W.M.L.
1832/3	Robin	M. J. Wardle	Beulah	9.8.17	W.M.L
1717/3	Royal Colours	T. N. Davies	Horsham	11.7.17	W.M.L.
1825/3	Royal McCormack	W. C. Childs	Royal Show Grounds	24.7.17	W.M.L.
1853/3	Scotch Blair	Patterson Bros.	Romsey Special Exam.	2.11.17	R.G.
1852/3	Scotty's Best	J. J. Power	Rochester	2.10.17	W.M.L.
1835/3	Shepherd Boy	A. H. Taylor	Birchip	21.8.17	W.M.L.
1716/3	Simon Pure	Mitchell and O'Brien	Horsham	11.7.17	W.M.L.
1845/3	Solomon Prince	G. Esler	Yarrawonga	4.9.17	W.M.L.
1848/3	The Link	J. R. Stokes	Ballarat	21.9.17	R.G.
1829/3	Wigton Again	A. and J. H. Young	Public Offices	28.7.17	W.M.L.
1831/3	Wimmera Ranger	T. Mibus	Hamilton	1.8.17	R.G.

LIST OF TERMINABLE CERTIFICATED STALLIONS—*continued.*

Cert. No.	Name of Horse.	Owner.	Parade.	Date of Examination.	Officer.
			LIGHT HORSES.		
1836/3	All Black	J. Marks	Elmore	24.8.17	W.M.L.
1846/3	Borneo	A. G. Hunter ..	Seymour	6.9.17	W.M.L.
1839/3	Latest Fashion ..	T. O. Hunter ..	Bendigo	30.8.17	R.G.
1850/3	Moving Picture ..	G. H. Alford ..	Royal Show ..	24.9.17	R.G.
			PONIES.		
1847/3	Bonnie Wizard ..	W. Morey ..	Dookie	11.9.17	R.G.
1849/3	Haldor	Mrs. McLellan ..	Royal Show	24.9.17	W.M.L.
1850/3	Lord Bally	G. Smith	Koroit	2.8.17	R.G.
1851/3	Somerton Sensation ..	W. E. J. Craig ..	Royal Show ..	24.9.17	R.G.

(Two-year-old Certificates expiring 30th June, 1918.)

Cert. No.	Name of Horse.	Owner.	Parade.	Date of Examination.	Officer.
			DRAUGHTS.		
256/2	Diplomatist	E. A. Dahlenberg ..	Horsham	11.7.17	W.M.L.
255/2	Lord Clyde	D. L. Bodey ..	Horsham	11.7.17	W.M.L.
257/2	Philosopher	E. A. Dahlenberg ..	Horsham	11.7.17	W.M.L.
			LIGHT HORSES.		
258/2	Jack All Style ..	D. Whitchurch ..	Mildura	17.7.17	W.M.L.
			PONIES.		
259/2	Griff Bangor	Mrs. J. MacLellan ..	Royal Show	24.9.17	W.M.L.

It is pointed out by the secretary of the Percheron Society of America that exports of horses and mules have at last passed the million mark. Official figures given out by the Department of Foreign and Domestic Commerce show that during the 27 months ended 1st December, 1916, 1,029,961 horses and mules, valued at £45,196,240, were exported from the United States. Most of these went directly to the European war territory. Purchases are continuing at a heavy rate.

A member of a firm which has sold more than 70,000 horses annually for the last two years estimates that the prices which farmers realized for the horses on the farm were substantially as follows:—Cavalry horses, £24 per head; French artillery horses, £29 5s.; British artillery horses, £34 7s. 6d.; draught horses weighing more than 1,650 lbs., £44 15s. to £50. Horses from 1,000 to 1,100 lbs. in weight have brought farmers £24 each, but one cross of draught horse blood on the same mare that was used to produce this light cavalry horse would have produced a horse ranging from 1,200 to 1,500 lbs. in weight, thus raising the value from £24 to £29 5s. or £34 7s. 6d. per head. One cross of draught blood increased the value of the progeny from light-weight mares from £7 to £10, and a second cross on the half-blood mares from £7 to £10 more. In the judgment of the most experienced market men, fully 75 per cent. of the horses sold abroad for artillery and transport work have been grade Percherons.—*Producers' Review*, April, 1917.

A CONTRIBUTION TO THE STUDY OF HEREDITARY UNSOUNDNESS IN HORSES.

By W. A. N. Robertson, B.V. Sc., Chief Veterinary Officer.

During the eleven years in which the Government certification of stallions has been in operation, a total of 7,894 horses has been examined. Of this number, 4,957 were draught horses, and 842, or 16.9 per cent., of these were unsound.

For the purpose of ascertaining to what extent unsoundness is hereditary, the pedigree through the sire line of nearly all the draught horses has been tabulated, as shown in the following tables. Draught horses only have been taken for the reason that, from the greater number examined and also rejected, more weight can be given to deductions drawn. The tables show all the generations in their proper relation to one another from the foundation member, which member may, and in most cases does, represent a horse that has never been in Australia.

I have said that nearly all the pedigrees of the draught horses have been tabulated. Approximately 500 have not been included, for the reason that their full pedigree cannot be obtained. Owners have been written to, and old-established newspapers and records have been searched for information, but without avail. The policy has been not to include any horse unless the evidence of his breeding was quite clear, and the difficulties encountered here will be recognised when it is known that there are recorded 5 British Oaks, 8 Champions, 7 Clansmen, 7 Commanders, 15 Crown Princes, 6 Darnleys, 9 Dreadnoughts, 5 Dundonalds, 7 Gallant Lads, 6 King Georges, 10 Lord Clydes, 10 Lord Roberts, 10 Prince Alberts, 13 Prince Charlies, 8 Prince of Wales, 11 Sir Williams, 9 Young Champions, and so on. It is quite uncommon to meet with a stallion whose name has not been at least duplicated.

In such circumstances, when only a short pedigree is given, going back, say, for sake of illustration, to Prince Charlie, without any identification as to which of the thirteen Prince Charlies is meant, it has been impossible to tabulate that horse's pedigree.

The owner of each horse was written to and asked to supply the necessary information. A very large number responded, but no notice has been taken by the owners of quite 500 stallions. Amongst these 500 there probably would be about 200 unsound horses, of which information was sought. It is quite possible that many of the horses referred to in the tables as "Not examined" were, in point of fact, examined, but the evidence is not sufficient to link them together.

It will be readily apparent that the names of stallions cannot be published. The system that has been adopted is to give a number to the foundation member, 1, 2, 3, &c., and to use decimal points for the subsequent generations, 1.1, 1.2, 1.3 representing the first, second, and third son of 1 respectively. This arrangement does not refer to order of birth, but merely to first, second, or third son recorded, and so on. Another figure is used in the next generation, 1.39 representing the ninth recorded son of the third recorded son of the founder 1. When over nine sons are dealt with, the cypher 0 is used in front of the unit of that generation, and represents 9, thus 1.04 is the thirteenth, and 1.0004 is the thirty-first (9+9+9+4). Each of these refers to the first generation; the

number of noughts preceding a unit being counted with the unit. In this way the numbers 1.002,1,6,003 shows four generations from founder 1, and, reading backward, we get twenty-first son of sixth son of first son of twentieth son of 1. (The commas are introduced to show the meaning clearly.)

That the tendency to develop unsoundness is hereditary is admitted. It is hoped that the tables following will confirm this in a more direct and unmistakable manner than has previously been attempted. Further, an effort will be made to show the influence the dam exerts in introducing unsoundness into sound families, and conversely, soundness into unsound ones. The clearest indication of this is seen in families twenty-eight and sixteen.

Twenty-eight was not examined; four of his sons were, and found sound at five years of age. Fourteen of his grandsons were also sound—at mature age, in most cases—one of them, 28.033, though certificated at five years, was known to be sound at ten years of age, yet one of his sons, 28.0332, the only unsound member of this family, was affected with sidebone as a three-year old. The dam of this horse was by 16, a horse that was not examined, but which left five badly side-boned horses, and one sound one; the dam of 28.0332 was known to be unsound. The sound member of 16 family was from a mare by a son, not recorded, of 9.11—only two of this horse's sons were examined—one at six years, one at four years of age—and both were sound. As will be seen at a later date this is a sound branch of the family 9. In this case it appears that 9.11 has introduced soundness into family 16, and 16 has introduced unsoundness into 28 through the respective dams.

Whilst this is quite a clear case, the families concerned are of very short line, but similar facts will appear in other families, in which a greater number of progeny is recorded. It is not always possible to trace the dam's breeding for the same reason as that given in the case of sires. One aspect of the question which must not be lost sight of is, that while the presence of sidebone must be accepted as direct evidence of unsoundness, the absence cannot be accepted as evidence of pure soundness, unless the animal is of mature age, or unless a sufficient number of his progeny has been examined and found sound to warrant a conclusion being drawn. Further, it is possible that the tendency to develop unsoundness may not be evident in a stallion, yet may be transmitted by him to show in a later generation.

The tables of families 28 and 16, above referred to, are as follows:—

FAMILY 28.

28	28.1, not examined	28·11, sound, 5	
		28·12, sound, 5	
	28·2, not examined	28·21, sound, 4	
	28·3, not examined	28·31, sound, 5	
	28·4, not examined	28·41, sound, 4	
	28·5, sound, 5		
	28·6, not examined	28·61, sound, 4	
	28·7 sound, 5		
	28·8, sound, 5	28·81, sound, 3	
	28·9, not examined	28·91, sound, 4	
	28·01, not examined	28·011, sound, 3	
	28·02, not examined	28·021, sound, 4	
	28·03, not examined	28·031, sound, 5	28·0312, sound, 2
			28·0311, sound, 2
		28·032, sound, 5	
		28·033, sound, 5	28·0331, sound, 3
			28·0332, SIDEBONE, 3
	28·04, sound, 5		
	28·05, not examined	28·051, sound, 4	

FAMILY 16.

16, not examined —— 16·1, sound 4
16·2, SIDEBONE, 4
16·3, SIDEBONE, 4
16·4, SIDEBONE, 4
16·5, SIDEBONE, 3
16·6, SIDEBONE, 4
16·7, dam of 28·0332, SIDEBONE

Only the unsoundnesses, sidebone and ringbone, are taken into consideration. While other defects are shown in the tables, the horses are regarded as sound, inasmuch as they are not affected with sidebone or ringbone.

The figure following the condition of the horse indicates the age at time of examination, and the term "Sound D.A.P." indicates that though sound a certificate was refused on the ground of disapproval.

A Consideration of the Families.

Family 1. In this family 815 descendants have been examined, and 172, or 21.1 per cent., were unsound.

Table showing summary of unsoundness.

FAMILY 1.

Sire.	Sons.			G Sons.			GG Sons.			GGG Sons.			GGGG Sons.			GGGGG Sons.		Total.		
	Examined.	Unsound.	Percentage.	Examined.	Unsound.	Percentage.	Examined.	Unsound.	Percentage.	Examined.	Unsound.	Percentage.	Examined.	Unsound.	Percentage.	Examined.	Unsound.	Examined.	Unsound.	Percentage.
1·1 ..	21	11	52·4	72	27	37·5	30	10	33·3	1	..	..	..	..	..	..	..	124	48	38·7
1·2 ..	..	..	..	1	..	..	45	16	35·5	43	7	16·3	..	..	..	..	..	89	23	25·8
1·3 ..	..	..	..	5	2	40·0	62	17	27·4	34	8	23·5	31	4	12·9	..	..	132	31	23·5
1·4 ..	..	..	..	1	..	..	12	1	8·33	1	..	..	..	..	..	..	..	14	1	7·1
1·5 ..	..	..	..	..	..	..	2	2	100·0	1	..	..	..	..	..	..	..	3	2	66·6
1·6 ..	..	..	..	..	..	..	..	..	..	4	..	..	17	4	23·5	..	..	21	4	19·0
1·7 ..	..	..	..	24	3	..	37	4	10·8	7	..	..	1	1	100·0	..	..	69	8	11·6
1·8 ..	..	..	..	7	1	14·3	56	17	30·4	16	3	18·8	..	..	..	..	..	79	21	26·6
1·9 ..	..	..	..	5	1	20·0	3	2	66·6	..	..	..	..	..	..	..	..	8	3	37·5
1·01 ..	..	..	..	1	..	..	4	2	50·0	4	..	..	..	..	..	..	..	9	2	22·2
1·02 ..	..	..	..	9	1	11·1	19	2	10·5	5	1	20·0	..	..	..	..	..	33	4	12·1
1·03 ..	1	1	100·0	2	1	50·0	3	1	33·3	..	..	..	..	..	..	..	..	6	3	50·0
1·04 ..	..	..	..	2	..	..	3	..	..	..	..	..	..	..	..	..	..	5	..	..
1·05 ..	1	..	..	6	1	16·6	7	..	..	41	5	12·2	13	1	..	..	..	68	7	10·3
1·06 ..	..	..	..	7	1	14·3	..	..	..	..	..	..	..	..	..	..	..	7	1	14·3
1·07 ..	..	..	..	..	..	..	14	..	..	37	2	5·4	1	1	100·0	..	..	52	3	5·8
1·08 ..	..	..	..	..	..	..	12	3	25·0	9	3	33·3	1	..	..	..	..	22	6	27·3
1·09 ..	..	..	..	7	1	14·3	6	1	16·6	19	..	..	..	..	..	..	..	32	2	6·2
1·001 ..	..	..	..	..	..	..	..	..	..	1	..	..	8	..	..	2	..	11	..	..
1·002 ..	..	..	..	..	..	..	20	1	5·0	11	2	18·2	..	..	..	..	..	31	3	9·7
Total	23	12	52·2	149	39	26·2	335	79	23·6	234	31	13·2	72	11	15·2	2	..	815	172	21·1

Sub-families 1.7, 1.02, 1.07, 1.09, and 1.002 do not show a large amount of unsoundness. If pedigrees could be traced on the dam's side it would probably be found that sound blood had been introduced through them. An effort has been made to do this, but the pedigrees only go back to horses which cannot be identified as being in these tables, or of which there is no record.

None of the sons of 1 was examined, but twenty-three grandsons were, and they showed 52 per cent. of unsoundness—practically all of this is seen in the sons of 1.1.

One hundred and forty-nine grandsons show 26 per cent. unsoundness. Half of this is in 1.1, which is, without doubt, the most unsound sub-family—showing 38.7 per cent. unsoundness in 124 descendants recorded.

A fact that must not be overlooked in considering these tables, and particularly with the progeny of this horse, is that a number of animals reported sound were so at three years of age. There is no doubt whatever that many of these would prove unsound at more mature age. Experience has shown that, in respect of all families, both sound and unsound, up to 20 per cent. which are sound at three years are rejected at four and five years.

Of the 76 descendants of 1.1 which were sound, twenty-four were three years old, or under, at examination.

Sub-family 1.2 divides itself into two branches—1.21 and 1.22, and their progeny. The former shows a large proportion of unsoundness, while the latter shows only one unsound, viz., 1.22145, and this horse was from a mare by 3.108, a member not examined, but of the very unsound family 3. Evidently this is another case of soundness being introduced into the line, possibly through 1,221.

Whilst the descendants of 1.3 are undoubtedly badly affected, showing 23.5 per cent. unsound animals out of 132 examined, there is one line of his descendants through 1.34223 which has lost the taint; out of thirty of the sons of the latter examined, four only show unsoundness, and on the dam's side their breeding is as under:—

The dam of 1.342232 is by 38, sire of 38.2.

The dam of 1.342236 is by 38.2, badly unsound.

The dam of 1.34223001 is by 38.2, badly unsound.

The dam of 1.342230002 is by 1.6111, the granddam being by 38.

1.6111 was not examined; the limited number of his progeny, which were 19 per cent., were found unsound.

Thirty-eight was not examined, but it will be observed later that he occurs very frequently on the dam's side of unsound horses.

Another sub-family, which shows an endeavour to establish soundness, is through 1.71—8, or 11.6 per cent., of his progeny were unsound; but it can be shown that, in respect of the following, unsoundness was carried in the dam's blood:—

The dam of 1.713 was by 2.103, not examined, probably sound.

The granddam was by 3, not examined, but the sire of a very unsound family.

The dam of 1.719 was by a son of 3.

The dam of 1.7107 was by 7.311009, probably sound; granddam was by 9.51, not examined, but showing 28 per cent. unsoundness in his progeny.

The dam of 1.710021 was by a son of 3.1.

The dam of 1.71142 was by 29.112, a sire showing 35 per cent. unsoundness in his progeny.

1.8 is an interesting family; though 1.811 was sound as an aged horse, 33 per cent. of his sons were unsound, as under:—

1.8118 from a mare by 4.131, whose two sons examined were unsound.

1.8119 from a mare not recorded.

1.81102 from a mare not recorded—granddam by 3.2.

1.81106 from a mare by 4.13, sire of 4.131, above.

1.81109 from a mare by 29.2112, granddam not recorded.

1.811002 from a mare by 3.3, of unsound family.

1.811003 from a mare not recorded.

1.811007 from a mare by 2.1, probably sound, granddam not recorded.

1.811008 from a mare by 4.13, sire of 4.131, above.

1,811009 from a more by 3.3, of unsound family.

1.8110003 from a mare by 9.51, of unsound family.

1.8110009 from a mare not recorded.

A study shows that in nearly all cases the mares are from unsound lines, and it is probable that the unsoundness latent in 1.811, on meeting with unsoundness from the female side, has shown up in what might have been a sound family if bred always to sound mates.

A very similar condition is seen in the family of 1.05411, himself sound. Fifty-three of his progeny were examined, and six were unsound.

The dam of 1.054117 was by 3.1020003, a very unsound horse.

The dam of 1.0541108 was by 3.13, a very unsound horse.

The dam of 1.0541100001 was by 1.333, of unsound family, the granddam by 38.

The dam of 1.0541100002 was by 1.333, above.

The dam of 1.05411071 was by 7.24, an unsound horse.

Stallion 1.0711 was not examined; fifty-two of his progeny were, and three showed unsoundness. The pedigree of the dam of 1.0711304 is not extended far enough to determine definitely her sire. He was probably 9.1202, of unsound line.

The dam of 1.07110671 was by 7.231, of unsound family, and the granddam by 4.13, also of unsound line.

The dam of 1.07110042 was by 9.515, which appears frequently in unsound pedigrees, and is of unsound blood; the granddam was by 4.131, the sire of an unsound family.

1.00211 shows nineteen sound and one unsound son, and nine sound and two unsound grandsons; the two latter have the blood of 22 and of 3.1 in their veins, both of which families are unsound—the latter particularly so.

The complete table of all generations of this family is as under:—

FAMILY 1.

1	1·1, not-examined	1·11, SIDEBONE, 11	1·111, SIDEBONE, 5		
			1·112, SIDEBONE, 6	1·1121, SIDEBONE, 4	
				1·1122, sound, 8	
			1·113, SIDEBONE, 4		
			1·114, SIDEBONE, 5		
			1·115, SIDEBONE, 3		
			1·116, SIDEBONE, 4		
			1·117, SIDEBONE, 9		
			1·118, SIDEBONE, 5		
			1·119, SIDEBONE, 3	1·1195, SIDEBONE, 3	
				1·1194, SIDEBONE, RINGBONE, 3	
				1·1193, SIDEBONE, 3	
				1·1192, SIDEBONE, 5	
				1·1191, SIDEBONE, 5	
				1·1196, sound D.A.P. 5	
				1·1197, sound, 2	
				1·1198, sound D.A.P.	
				1·1199, sound, 4	
				1·11901, sound, 3	
			1·1101, SIDEBONE, 3		
			1·1102, SIDEBONE, 4		
			1·1103, SIDEBONE, 4		
			1·1104, sound, 5		
			1·1105, sound, 5		
			1·1106, not examined	1·11061, SIDEBONE, 3	
			1·1107, sound, 3	1·11071, sound, 2	
			1·1108, sound, 3	1·11081, sound D.A.P.	
				1·11082, sound, 4	
			1·1109 not examined	1·11091 SIDEBONE, 4	
		1·12, SIDEBONE, RINGBONE, 8	1·121, sound, 3		
		1·13, RINGBONE, 9	1·131, RINGBONE, a		
			1·132, SIDEBONE, 12		
			1·133, sound, 14	1·1331, SIDEBONE, 5	
			1·134, not examined	1·1341, sound, 5	
			1·135, sound, 6		
			1·136, sound, 5	1·1361, SIDEBONE, 5	
				1·1362, sound, 5	
			1·137, sound, 2		
		1·19, SIDEBONE, a			
		1·107, SIDEBONE, a			
		1·108, SIDEBONE, 4			
		1·109, RINGBONE, a			
		1·1001, SIDEBONE, 6			
		1·14, not examined	1·141, SIDEBONE, 3		
			1·142, sound, 8		
			1·143, sound, 5		
		1·15, not examined	1·151, SIDEBONE, 4		
			1·152, sound D.A.P., 7		
			1·153, sound, 3		
			1·154, sound, 5		
		1·16, not examined	1·161, SIDEBONE, 3		
			1·162, sound, 5		
			1·163, sound, 3		
		1·17, sound, a	1·171, sound D.A.P., 5		
			1·172, sound, 4	1·1721, sound, 3	
			1·173, sound, 5		
		1·18, not examined	1·181, SIDEBONE, 4		
			1·182, SIDEBONE, 3		
			1·183, sound, 5	1·1831, sound, 4	
			1·184, sound, 3		
			1·185, sound, 4		
			1·186, sound, 5		
			1·187, sound, 3		
			1·188, sound, 3		
			1·189, sound, 3		
			1·1801, sound, 4		
		1·101, sound, 3			
		1·102, not examined	1·1021, SIDEBONE, 5		
			1·1022, not examined	1·10221, sound, 5	
		1·103, sound, 5	1·1031, sound, 8	1·10311, sound D.A.P. 3	
				1·10312, sound, 5	
				1·10313, sound, 4	1·103131, sound D.A.P., 3
				1·10314, sound, 3	
		1·104, sound, a			
		1·105, sound, D.A.P., 10			
		1·106, sound, a			
		1·1002, not examined	1·10021, sound, 8		
		1·1003, sound, a	1·10031, sound, a		
		1·1004, not examined	1·10041, SIDEBONE, 5		
		1·1005, sound D.A.P. 10			

Family 1—*continued.*

1	1·1 not-examined —*contd.*	1·1006, sound, a	1·10061, sound, a		
			1·10062, sound, 5		
			1·10063, sound, a		
			1·10064, sound, 9		
			1·10065, sound, 3		
		1·1007, SIDEBONE, a	1·10071, SIDEBONE, 5		
		1·1008, not examined	1·10081, sound, a		
			1·10082, sound, 6		
		1·1009, sound, 7	1·10091, SIDEBONE, 4		
		1·10001, SIDEBONE, a	1·100011, SIDEBONE, 3		
		1·10002, not examined	1·100021, SIDEBONE, 5		
		1·10003, not examined	1·100031, SIDEBONE, RINGBONE, a	1·1000311, sound D.A.P., 3	
		1·10004, SIDEBONE, a	1·100041, sound, 4	1·1000312, sound, 4	
		1·10005, not examined	1·100052, sound, 3		
			1·100053, sound, 3		
			1·100054, sound, 3		
			1·100055, sound, 4		
			1·100057, sound, 6		
			1·100058, sound, 4		
			1·100051, sound D.A.P. 3		
			1·100056, SIDEBONE, 3		
	1·2, not examined	1·21, not examined	1·211, not examined	1·2111, SIDEBONE, 3	
				1·2112, SIDEBONE, 3	
				1·2117, SIDEBONE, 4	
				1·2119, SIDEBONE, 3	
				1·21101, SIDEBONE, 3	
				1·21102, SIDEBONE, 2	
				1·21103, SIDEBONE, 3	
				1·21104, SIDEBONE, 6	1·211044, SIDEBONE,
					1·211042, sound D.A.
					1·211043, sound, 4
					1·211041, sound, 4
				1·21108, SIDEBONE, 4	1·211081, SIDEBONE, 3
				1·211001, SIDEBONE, 2	
				1·211003, SIDEBONE, 3	
				1·211006, SIDEBONE, 3	
				1·211009, SIDEBONE, 4	
				1·2110002, SIDEBONE, 4	
				1·2110008, SIDEBONE, 3	
				1·2110009, SIDEBONE, 4	1·21100091, SIDEBONE
				1·21105, sound D.A.P. 3	
				1·21106, sound D.A.P. 6	
				1·2114, sound, 3	1·21141, sound, 5
					1·21142, sound, 5
				1·2115, sound, 5	
				1·2116, sound, 5	
				1·2113, sound, 3	1·21131, SIDEBONE, 3
					1·21132, SIDEBONE, 4
					1·21133, sound, 3
					1·21134, sound, 5
					1·21135, sound, 5
				1·2118, sound, 5	
				1·21107, sound, 2	
				1·21109, sound, 5	
				1·211002, sound, 5	
				1·211004, sound, 5	
				1·211005, sound, 5	
				1·211007, not examined	1·2110071, sound, 6
				1·211008, sound, 3	1·2110081, SIDEBONE, 4
					1·2110082 sound, 3
					1·21100083 sound, 2
				1·2110001, sound, 4	
				1·2110003, sound, 5	
				1·2110004, sound, 3	1·21100041, sound, 3
				1·2110005, sound, 5	
				1·2110006, sound, 4	1·21100061, sound, 3
				1·2110007, sound, 3	
				1·21100001, sound, 4	1·211000011, sound D.A.P., 4
				1·21100002, sound, 4	1·211000021, sound D.A.P., 3
				1·21100003, sound, 3	1·211000031, sound D.A.P., 3
				1·21100004, sound	

FAMILY 1—*continued.*

1	1·2 not-examined —*contd.*	1·22, not examined	1·221, not examined	1·2211, sound, 4	
				1·2212, sound, 5	1·22121, sound, 3
					1·22122, sound, 3
					1·22123, sound, 3
					1·22124, sound, 3
					1·22125, sound, 5
					1·22126, sound D.A.P.
				1·2213, sound, 3	1·22131, sound, 5
					1·22132, sound, 3
					1·22133, sound, 3
				1·2214, not examined	1·22141, sound, 3
					1·22142, sound, 4
					1·22143, sound, 5
					1·22144, sound, 3
					1·22145, RINGBONE, 3
				1·2215, not examined	1·22151, sound D.A.P. 5
					1·22152, sound, 3
				1·2217, sound, 3	
				1·2216, not examined	1·22161, sound, 5
					1·22162, sound, 3
				1·2218, not examined	1·22181, sound, 5
				1·2219, not examined	1·22191, sound, 3
					1·122192, sound, 3
			1·222, sound, a	1·2221, sound, 5	
				1·2222, sound, 5	
	1·3 not-examined	1·31, not examined	1·311, sound	1·3111, sound, 4	
				1·3112, SIDEBONE, 5	
				1·3113, SIDEBONE, 7	
				1·3114, sound D.A.P., 5	
				1·3115, SIDEBONE, 6	1·31151, sound, 4
			1·312, sound	1·3121, not examined	1·31211, SIDEBONE, 3
					1·31212, sound, 5
				1·3122, sound, 4	1·31221, sound, 3
				1·3124, sound, 3	
				1·3126, sound, 9	
				1·3127, sound, 3	
				1·3128, sound, 3	
				1·31201, sound, 3	
				1·31202, sound, 3	
				1·31204, sound, 3	
				1·31208, sound, 6	1·312081, sound, 5
				1·312001, sound, a	
				1·312002, sound, 3	
				1·312004, sound, 5	
				1·312005, sound, 3	
				1·312006, not examined	1·3120061, RINGBONE, 5
					1·3120062, sound D.A.P., 3
				1·312007, sound, 3	
				1·312008, sound, 5	
				1·3123, sound D.A.P., 6	
				1·3125, sound D.A.P., 5	
				1·3129, sound D.A.P., 3	
				1·31203, SIDEBONE, 3	
				1·31205, SIDEBONE, RINGBONE, 4	
				1·31206, SIDEBONE, 3	
				1·31209, Bog Spv., 3	
				1·312003, SIDEBONE	
			1·314, not examined	1·3141, sound, 6	1·31411, sound, 3
					1·31413, sound, 4
					1·31414, sound, 3
					1·31417, sound, 3
					1·31412, sound D.A.P. 3
					1·31415, SIDEBONE, 4
					1·31416, SIDEBONE, 3
				1·3142, sound, 3	
				1·3144, sound, 4	
				1·3145, sound, 4	
				1·3143, RINGBONE, 4	
				1·3148, SIDEBONE, 10	1·31481, sound D.A.P., 3
					1·31482, sound, 3
					1·31483, sound, 5
					1·31484, SIDEBONE, 4
				1·3146, Bog Spv., 8	
				1·3147, not examined	1·31471, sound, 3
			1·315, not examined	1·3152, sound, 3	1·31521, sound D.A.P., 4
			1·316, not examined	1·3161, sound, 4	1·31611, SIDEBONE, 4
				1·3162, sound, 4	
				1·3163, SIDEBONE, 3	
				1·3164, SIDEBONE, 7	
		1·32, not examined	1·321, sound, 3		
			1·322, not examined	1·3221, Rr. 7	
				1·3222, Cb. 3	
				1·3223, sound, 3	
				1·3224, sound, 3	
			1·323, SIDEBONE a		

FAMILY 1—*continued.*

1	1·3 not-examined —*contd.*	1·33, not-examined	1·331, not examined	1·3311, SIDEBONE, 7		
				1·3313, sound, 4	1·33131, SIDEBONE, 4	
					1·33132, SIDEBONE, 4	
			1·332, not examined	1·3321, sound, 3		
			1·333, not examined	1·3331, sound, a		
			1·335, not examined	1·3351, sound, 5		
				1·3352, sound, 7		
				1·3353, sound D.A.P. a		
			1·334, SIDEBONE, a			
		1·34, not-examined	1·341, not-examined	1·3411, sound, 3		
				1·3412, sound, 5	1·34121, sound D.A.P.	
				1·3413, not examined	1·34131, sound, 3	
				1·3414, sound, 5	1·34141, sound, 3	
				1·3415, sound, 3		
				1·3416, sound, 3		
				1·3417, sound, 3		
				1·3418, sound, 5		
				1·3419, not examined	1·34191, sound, 3	
					1·34192, sound, 3	
					1·34193, sound, 3	
				1·34101, sound, 3		
				1·34102, sound, 3		
				1·34103, sound, 3		
				1·34104, RINGBONE, 4		
			1·342, not-examined	1·3421, not examined	1·34211, sound, 5	
					1·34213, sound, 3	
					1·34214, sound, 5	
					1·34212, sound D.A.P. 2	
				1·3422, not examined	1·34221, not examined	1·342211, sound, 3
					1·34222, sound, 5	
					1·34223, sound, 6	1·342231, sound, 5
						1·342233, sound, 3
						1·342234, sound, 5
						1·342235, sound, 5
						1·342238, sound, 3
						1·3422301, sound, 3
						1·3422302, sound, 3
						1·3422304, sound, 5
						1·3422305, sound, 5
						1·3422307, sound, 4
						1·3422308, sound, 3
						1·3422309, sound, 4
						1·34223002, sound, 3
						1·34223003, sound, 2
						1·34223004, sound, 4
						1·34223007, sound, 2
						1·34223008, sound, 4
						1·34223009, sound, 3
						1·342230001, sound, 3
						1·342230002, sound, 3
						1·342237, sound D.A.P., 3
						1·342239, sound D.A.P., 3
						1·3422303, sound D.A.P., 3
						1·3422306, sound D.A.P., 2
						1·34223005, sound D.A.P., 2
						1·34223006, sound D.A.P., 3
						1·342232, SIDEBONE, 3
						1·342236, RINGBONE, 3
						1·34223001, SIDEBONE, 5
						1·342230002, SIDEBONE, 7
	1·4, not-examined	1·41, not-examined	1·411, sound, 7	1·4111, sound, 4		
				1·4113, sound, 2		
				1·4114, sound, 5		
				1·4115, sound, 5		
				1·4116, sound, 4		
				1·4117, sound, 3		
				1·4118, sound, 3	1·41181, sound, 3	
				1·4119, sound, 3		
				1·41102, sound, 3		
				1·41101, sound D.A.P., 5		
				1·4112, RINGBONE, 3		
			1·412, not examined	1·4121, sound, 4		

FAMILY 1.—*continued.*

- 1
  - 1·5, not examined
    - 1·51, not examined
      - 1·511, not examined
        - 1·5111, RINGBONE, a
        - 1·5112, SIDEBONE, a
          - 1·51121, sound, 3
  - 1·6, not examined
    - 1·61, not examined
      - 1·611, not examined
        - 1·6111, not examined
          - 1·61111, sound, 5
            - 1·611111, sound, 6
            - 1·611112, sound, 5
            - 1·611113, sound, 4
            - 1·611116, sound, 5
            - 1·611117, sound, 3
            - 1·611114, SIDEBONE, 4
            - 1·611115, SIDEBONE, 4
            - 1·611118, SIDEBONE, 3
          - 1·61112, sound, 8
            - 1·611121, sound, 5
            - 1·611123, sound, 5
            - 1·611125, sound, 4
            - 1·611126, sound, 4
            - 1·611127, sound, 4
            - 1·611129, sound, 4
            - 1·611122, sound D.A.P., 3
            - 1·611128, sound D.A.P., 3
            - 1·611124, SIDEBONE, 5
          - 1·61113, sound, 6
          - 1·61114, sound D.A.P., a
  - 1·7, not examined
    - 1·71, not examined
      - 1·711, sound
        - 1·7111, sound, 3
        - 1·7112, sound, 5
        - 1·7113, sound, 3
        - 1·7114, sound, 3
        - 1·7115, sound, 4
        - 1·7116, sound, 3
        - 1·7117, sound, 3
      - 1·712, sound, 3
      - 1·715, sound, 5
      - 1·716, sound, 3
      - 1·717, sound, 3
      - 1·718, not examined
        - 1·7181, sound, 5
        - 1·7182, sound, 3
      - 1·7101, sound, 3
      - 1·7102, sound, 5
      - 1·7103, sound, 4
      - 1·7104, sound, 4
        - 1·71041, sound, 5
        - 1·71042, sound, 3
        - 1·71043, sound, 5
      - 1·7105, sound, 5
      - 1·7106, sound, 3
      - 1·7108, sound, 3
      - 1·71001, sound, 3
      - 1·71002, not examined
        - 1·710021, SIDEBONE, 5
        - 1·710022, sound, 3
      - 1·71003, sound, 4
      - 1·71004, sound, 3
      - 1·71005, sound, 4
      - 1·714, sound, 4
        - 1·7141, sound D.A.P., 6
        - 1·7142, RINGBONE, 6
      - 1·713, SIDEBONE, 6
      - 1·719, SIDEBONE, RINGBONE, 6
      - 1·7107, SIDEBONE, 3
      - 1·7109, sound D.A.P., 5
    - 1·72, not examined
      - 1·721, not examined
        - 1·7211, not examined
          - 1·72111, sound, 4
      - 1·722, sound, 6
      - 1·723, sound, 4
      - 1·724, sound, 5
      - 1·725, not examined
        - 1·7251, sound, 5
      - 1·726, not examined
        - 1·7261, SIDEBONE, 4
        - 1·7267, SIDEBONE, 3
        - 1·7266, sound D.A.P., 4
        - 1·7262, sound, 3
        - 1·7263, sound, 3
        - 1·7264, not examined
          - 1·72641, sound D.A.P., 3
          - 1·72642, sound, 4
        - 1·7265, sound, 3
      - 1·727, not examined
        - 1·7271, sound, 5
      - 1·728, 5
      - 1·729, not examined
        - 1,7291, not examined
          - 1·72911, not examined
            - 1·729111, SIDEBONE, 4

FAMILY 1—*continued.*

1	1·7, not-examined —*contd.*	1·72, not-examined —*contd.*	1·7201, not examined	1·72011, sound, 3	
				1·72012, sound, 5	
				1·72013, sound, 3	
			1·7202, not examined	1·72021, sound, 6	1·720211, sound, 5
			1·7203, not examined	1·72031, sound, 4	
				1·72032, sound, 5	
				1·72033, not examined	1·720331, sound, 4
				1·72034, sound, 7	
				1·72035, sound, 3	
				1·72036, sound, 3	1·720361, sound, 3
					1·720362, sound, 3
			1·7204, not examined	1·72041, sound, 3	
				1·72042, sound, 5	
				1·72043, sound, 2	
			1·7205, not examined	1·72051, sound, 5	
	1·8, not-examined	1·81, not-examined	1·811, sound, a	1·8111, sound, 3	1·81111, sound, 3
					1·81112, sound, 4
					1·81113, sound D.A.P., 3
					1·81114, sound D.A.P., 3
					1·81115, sound D.A.P., 5
				1·8112, sound, 3	
				1·8113, sound, 6	
				1·8114, sound, 3	
				1·8115, sound, 3	1·81151, sound, 3
				1·8116, sound, 3	
				1·8117, sound, 5	
				1·81103, sound 5	
				1·81104, sound, 4	
				1·81105, sound, 4	
				1·81108, sound, 3	
				1·81109, sound, 3	
				1·811001, sound, 5	
				1·811004, sound, 4	
				1·811005, sound, 3	
				1·811006, sound, 3	
				1·8110001, sound, 3	
				1·8110002, sound, 3	1·81100021, SIDEBONE, 5
				1·8110004, sound, 3	
				1·8110005, sound, 3	
				1·8110006, sound, 3	
				1·8110008, sound, 3	
				1·81101, sound D.A.P., 5	
				1·8110009, sound D.A.P., 3	
				1·8118, SIDEBONE, 4	
				1·8119, SIDEBONE, 6	
				1·81102, SIDEBONE, 4	
				1·81106, RINGBONE, 4	
				1·81109, SIDEBONE, 5	
				1·811002, SIDEBONE, RINGBONE, 5	
				1·811003, SIDEBONE, 6	
				1·811007, SIDEBONE, 3	
				1·811008, SIDEBONE, 4	1·8110081, sound, 2
					1·8110082, sound D.A.P., 3
				1·811009, SIDEBONE, 5	
				1·8110003, SIDEBONE, 5	
				1·8110007, SIDEBONE, 6	
			1·812, sound, 9	1·8121, sound, 5	
				1·8122, sound, 4	
			1·813, SIDEBONE, 9	1·8131, not examined	1·81311, sound, D.A.P.
				1·8133, sound, 5	
				1·8134, sound, 4	
				1·8135, sound, 3	
				1·8132, SIDEBONE, 5	
				1·8136, SIDEBONE, 4	
				1·8138, not examined	1·81381, sound, 5
					1·81384, sound, 3
					1·81382, SIDEBONE, 4
					1·81383, SIDEBONE, 3
				1·8137, sound, 4	
			1·814, sound, 6	1·8141, sound, 3	
				1·8142, sound D.A.P., 3	
				1·8143, sound, 3	
			1·815, sound, 5		
			1·816, sound, 6	1·8161, sound, 3	
				1·8162, sound D.A.P., 3	
				1·8163, SIDEBONE, 3	
				1·8164, SIDEBONE, 3	
			1·817, sound	1·8171, sound, 3	
				1·8172, sound, 3	
				1·8173, SIDEBONE, 4	

FAMILY 1—*continued.*

1	1·8, not-examined —*contd.*	1·82, not examined	1·821, not examined	1·8211, sound, 5	
				1·8212, sound, 7	
				1·8213, not examined	1.82131, sound, 5
					1·82132, sound, 3
	1·9, not-examined	1·91, not examined	1·912, sound, 9	1·9121, SIDEBONE, 5	
				1·9122, SIDEBONE, 3	
			1·913, sound, 5		
			1·915, not examined	1·9151, sound D.A.P., 4	
			1·916, sound, 4		
			1·914, sound D.A.P., 3		
			1·911, SIDEBONE, a		
	1·01, not-examined	1·011, not examined	1·0111, not examined	1·01111, not examined	1·011111, sound, D.A.P., 3
					1·011112, sound, 3
					1·011113, sound, 4
					1·011114, sound, 4
		1·012, not examined	1·0121, sound, 9	1·01211, SIDEBONE, 4	
				1·01214, SIDEBONE, 4	
				1·01212, sound, 3	
				1·01213, sound, 3	
	1·02, not-examined	1·021, not examined	1·0211, sound, 3	1·02113, sound, 4	
				1·02114, sound, 5	
				1·02116, sound, 3	
				1·02118, sound, 3	
				1·02119, sound, 3	
				1·02112, sound D.A.P. 5	
				1·02117, sound D.A.P. 3	
				1·02115, SIDEBONE, 4	
				1·02111, SIDEBONE, 3	
			1·0212, sound, a	1·02121, not examined	1·021211, sound, 5
					1·021212, sound, 5
				1·02122, not examined	1·021221, sound, 4
				1·02123, sound, 5	
				1·02124, sound, 3	
			1·0213, sound, 3	1·02131, spavin, 3	
				1·02132, roarer, 6	
				1·02133, sound, 3	
			1·0214, spavin, 5		
			1·0215, not examined	1·02151, sound, 4	1·021511, SIDEBONE, 5
				1·02152, sound, 5	1·021521, sound, 3
				1·02153, sound, 3	
				1·02154, sound, 3	
			1·0216, sound, 3		
			1·0217, sound, 3		
			1·0218, sound, 5		
			1·0219, sound, 3		
			1·02101, not examined	1·021011, sound, a	
			1·02102, SIDEBONE 3		
	1·03, not-examined	1·031 SIDEBONE a	1·0311 not examined	1.03111, sound, 5	
			1.0312 not examined	1.03121, sound, a	
			1·0313, sound, a		
			1·0314, SIDEBONE 6	1·03141, SIDEBONE, 5	
	1·04, not-examined	1·041, not examined	1·0411, sound, 6	1·04111, sound, 3	
				1·04112, sound, 3	
				1·04113, sound, 3	
		1·042, not examined	1·0421, sound, 4		
	1·05, not-examined	1·051, not examined	1·0511, RINGBONE, 7	1·05111, sound, 3	
				1·05112, sound, 4	
				1·05113, sound, 3	
				1·05114, sound, 5	1·051141, sound, 5
				1·05115, sound, 3	
			1·0512, sound, 3		
		1·052, sound, a	1·0521, sound, 2		
			1·0522, sound, 3		
			1·0523, sound, 5		
		1·053, not examined	1·0531, sound, 4	1·05311, sound, 3	
		1·054, not examined	1·0541, not examined	1·05411, sound, a	1·054111, sound, 6
					1·054112, sound, 5
					1·054115, sound, 3
					1·054116, sound, 5
					1·054118, sound, 5
					1·054119, sound, 6
					1·0541101, sound, 3
					1·0541102, sound, 4
					1·0541103, sound, 5
					1·0541104, sound, 6
					1·0541106, sound, 5

Family 1—*continued.*

1	1·05.—not examined—*contd.*	1·054,—not examined—*contd.*	1·0541 not examined—*contd.*	1·05411, not examined—*contd.*	1·0541107, sound, 5	1·0511071, SIDEBONE, 4
					1·0541108, sound, 4	1·05411081, curb, 3
						1·05411082, sound D.A.P., 3
						1·05411084, sound D.A.P., 4
						1·05411083, sound, 5
						1·05411085, sound, 5
					1·05411001, sound, 4	
					1·05111002, sound, 5	
					1·05411004, sound, 4	
					1·05411005, sound, 5	
					1·05411003, not examined	1·054110031, sound
					1·05411007, sound, 3	1·054110071, sound D.A.P., 4
					1·05411009, sound, 4	
					1·054110001, sound, 4	
					1·054110002, sound, 4	1·0541100021, sound, 4
					1·054110003, sound, 3	1·0541100031, sound, 5
					1·054110005, sound, 5	
					1·054110006, sound, 3	
					1·054110007, sound, 4	
					1·054110008, sound, 3	
					1·054110009, sound, 3	1·0541100091, string [halt,
					1·054114, sound D.A.P., 5	
					1·0541105, sound D.A.P., 5	
					1·0541109, sound D.A.P., 3	
					1·054113, roarer, 7	
					1·054117, SIDEBONE, 3	
					1·0541108, SIDEBONE, 7	
					1·0541100001, SIDEBONE, 4	
					1·0541100002 SIDEBONE, 4	
					1·05411006, curb, 5	
				1·05412, not examined	1·054123, sound, 3	1·0541231, sound, 5
						1·0541232, sound, 5
					1·054124, sound, 3	
					1·054121, sound D.A.P., a	
					1·054122, SIDEBONE, 5	
	1·06,—not examined	1·061,—not examined	1·0611, sidebone, 4			
			1·0612, sound, 5			
			1·0613, sound, 4			
			1·0614, sound, 3			
			1·0615, sound, 3			
			1·0616, sound, 2			
			1·0617, sound, 2			
	1·07,—not examined	1·071,—not examined	1·0711, not examined	1·07111, not examined	1·071111, sound, 5	
					1·071112, sound, 3	
					1·071113, sound, 3	
				1·07112, sound, 5		
				1·07113, sound, 3	1·071132, sound, 4	
					1·071133, sound, 4	
					1·071134, sound, 5	
					1·071137, sound, 3	
					1·071138, sound, 3	
					1·071139, sound, 4	
					1·0711301, sound, 3	
					1·0711303, sound, 5	
					1·071131, sound D.A.P., 5	
					1·071135, sound D.A.P., 5	
					1·071136, sound D.A.P., 4	
					1·0711302, sound D.A.P., 4	
					1·0711304, SIDEBONE, 5	
				1·07114, sound, 3		
				1·07115, sound, 3		
				1·071102, sound, 5		
				1·071103, sound, 3		
				1·071104, sound 8		

FAMILY 1—*continued.*

1	1·07, not examined —*contd.*	1·071, not examined —*contd.*	1·0711, not examined—*contd.*	1·07116, not examined	1·071161, sound, 3	
					1·071162, sound, 3	
				1·07117, not examined	1·071171, sound, 3	
				1·07118, not examined	1·071181, sound, 3	
				1·07119, sound, 4	1·071191, sound, 5	
					1·071192, sound, 4	
					1·071193, sound, 5	
					1·071194, sound, 3	
				1·071106, sound, a	1·0711061, sound, 3	
					1·0711062, sound, 2	
					1·0711063, sound, 2	
					1·0711064, sound, 6	
					1·0711065, sound, 3	
					1·0711066, sound, 5	
					1·0711067, not examined	1·07110671, SIDEBONE, 4
				1·071107, sound, 3		
				1·071108, sound, 6		
				1·071109, sound, 3		
				1·0711003, sound, 3		
				1·0711005, sound, 4		
				1·0711001, not examined	1·07110011, sound, 5	
				1·0711004, not examined	1·07110041, sound, 3	
					1·07110043, sound, 5	
					1·07110044, sound, 3	
					1·07110045, sound, 5	
					1·07110042, SIDEBONE, 3	
					1·07110046, sound D.A.P., 3	
	1·08, not examined	1·081, not examined	1·0811, not examined	1·08111, sound, 4		
				1·08114, sound, 6		
				1·08117, sound, 3		
				1·08119, sound, 4		
				1·081102, sonnd, 4		
				1·08112, not examined	1·081121, sound, 3	
				1·08113, sound, 5		
				1·08115, not examined	1·081151, sound, 3	
				1·08116, sound, 3	1·081162, sound, 5	1·0811621, sound, 2
					1·081161, sonnd D.A.P., 2	
					1·081164, sound D.A.P., 3	
					1·081163, SIDEBONE, 4	
					1·081165, SIDEBONE, 3	
				1·081101, sound, 7		
				1·081106, sound, 5		
				1·081105, not examined	1·0811051, sound, 5	
				1·081107, not examined	1·0811071, SIDEBONE, 3	
				1·081102, SIDEBONE, 4		
				1·081103, SIDEBONE, 4		
				1·081104, SIDEBONE, 3		
	1·09, not examined	1·091, not examined	1·0911, sound, 3			
			1·0912, not examined	1·09123, sound, 5		
				1·09124, sound, 4		
				1·09125, sound, 5		
				1·09121, sound D.A.P., 3		
				1·09122, RINGBONE, 5		
			1·0913, RINGBONE, 4			
			1·0914, sound, 5	1·09141, sound D.A.P., 3		
			1·0915, sound, 3			
			1·0916, sound, 4			
			1·0917, sound D.A.P., 3			
			1·0918, sound D.A.P., 3			

FAMILY 1—*continued.*

1] 1·09 — not examined —*contd.*	1·092, not examined	1·0921, not examined	1·09211, not examined	1·092111, sound, 3		
				1·092112, sound, 3		
				1·092113, sound, 3		
				1·092114, sound, 3		
				1·092115, sound, 5		
				1·092116, sound, 3		
				1·092117, sound, 4		
				1·092118, sound, 4		
				1·092119, sound, 5		
				1·0921101, sound, 5		
				1·0921102, sound, 4		
				1·0921103, sound, 3		
				1·0921105, sound, 3		
				1·0921106, sound, 5		
				1·0921107, sound, 4		
				1·0921108, sound, 4		
				1·0921109, sound, 3		
				1·09211001, sound, 3		
				1·0921104, sound D.A.P., 3		
1·001, not examined	1·0011, not examined	1·00111, not examined	1·001111, not examined	1·0011111, sound, 8	1·00111111, sound, 4	
					1·00111112, sound, 4	
					1·00111113, sound, 5	Sound, D.A.P. 3
					1·00111114, sound, 3	
					1·00111115, sound, 3	Sound, 3
					1·00111116, sound, 3	
					1·00111117, sound, 3	
					1·00111118, sound D.A.P., 5	
1·002, not examined	1·0021, not examined	1·00211, not examined	1·002111, sound, 4			
			1·002112, sound, 5			
			1·002113, sound, 5	1·0021131, sound, 3		
			1·002115, sound, 3			
			1·002116, sound, 5	1·0021161, sound, 3		
				1·0021162, sound D.A.P., 3		
			1·002118, sound, 3			
			1·002119, sound, 5			
			1·0021101, sound, 5			
			1·0021102, not examined	1·00211021, sound, 3		
			1·0021104, sound, 3	1·00211041, sound, 5		
			1·0021105, sound, 4			
			1·0021106, sound, 5			
			1·0021107, sound, 5	1·00211071, sound D.A.P., 5		
				1·00211073, sound D.A.P., 4		
				1·00211072, sound, 5		
			1·0021108, sound, 4			
			1·0021109, sound, 3			
			1·00211001, sound, 5	1·002110011, RINGBONE, 3		
				1·002110012, sound, 3		
			1·00211002, sound, 3			
			1·00211003, not examined	1·002110031, SIDEBONE, 4		
			1·00211004, sound, 4			
			1·0021103, sound D.A.P., 4			
			1·002114, SIDEBONE, 5			
			1·002117, bg. spavin, 4			
1·003, not examined	1·0031, not examined	1·00311, not examined	1·003111, SIDEBONE, RINGBONE, 8			

(To be continued.)

STANDARDIZED PACKING AND GRADING OF FRUIT.

By Ernest Meeking, Senior Fruit Inspector.

(Continued from page 240.)

EVIDENCE OF ROYAL COMMISSIONS.

The evidence given before the various Royal Commissions on the Fruit Industry has shown that the malpractices mentioned in the preceding chapter occur in all branches of the industry. In all, three Commissions—one Federal and two State—have exhaustively inquired into the conditions governing the industry. The first was appointed by the Commonwealth Government in 1912, the second by the New South Wales Government in 1913, and the third by the Government of Victoria in 1915. The findings of all the Commissions, on two points at least, were practically unanimous, viz., that co-operation amongst the fruit-growers, and the grading and packing of fruit under standardized methods were essential to place the industry on a proper basis.

Each Commission took evidence in every State from hundreds of witnesses, representing all branches of the fruit industry, and the summaries of all the Commissions showed conclusively that the present low status of the industry resulted from the non-existence of a proper basis of value between the seller and the purchaser. This disability was manifest all along the line, from the orchardist to the householder, and its influence was apparent throughout the many transactions which usually transpire during the transit of the fruit from the orchard to the household of the consumer. For example, tthe wholesale men, both buyers and agents, complained that, in many of their transactions with the orchardist, the latter supplied fruit which was improperly graded and packed, that is, graded and packed in such a way that fruits, which varied in degree of maturity, colour, and size, were packed in the same case. In addition, cases often contained a percentage of fruit affected by disease. The retailer complained also in a like manner, and naturally laid the blame, or most of it, on the wholesale men.

Little or no evidence was obtained from consumers, but had such been called, there is little doubt that a cloud of witnesses, in fact, all the consuming public of Australia, could have testified to victimization in fruit-purchasing transactions, and would, doubtless, have laid the blame on the shopkeeper or hawker from whom the fruit had been purchased.

Each of the parties concerned in the transaction of buying and selling a case of fruit is, therefore, prone to lay the blame on the party with whom he has had immediate dealings, and in this way only partly arrives at the truth.

Prevalence of Improper Packing.

It would seem at first sight that improper packing commences with the orchardist, that he is mainly responsible for its prevalence, and that if he in the first instance packed and graded his fruit properly, the improper packing and grading of fruit would be eliminated from the industry. This, however, is far from being so, as most of our leading orchardists grade and pack their fruit honestly, and as well as is possible under present conditions. Moreover, honesty in the matter of grading

and packing on the part of the grower does not always insure that he will receive the full value for his fruit, nor that the consumer will not

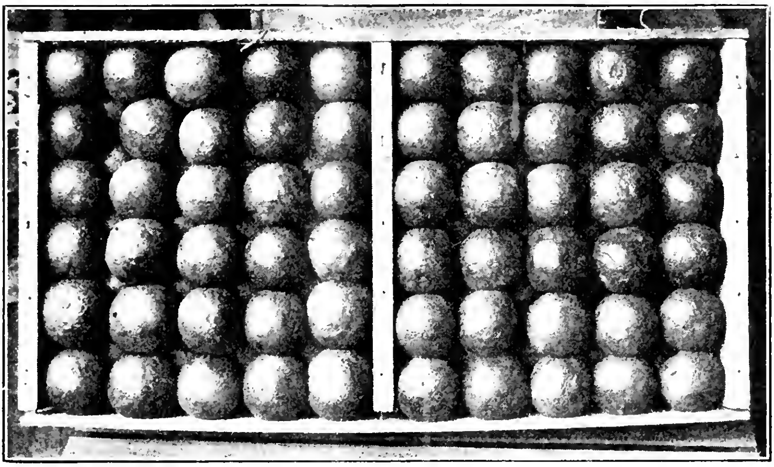


Plate I.—Case of Oranges, properly packed (square pack), containing 152 oranges.

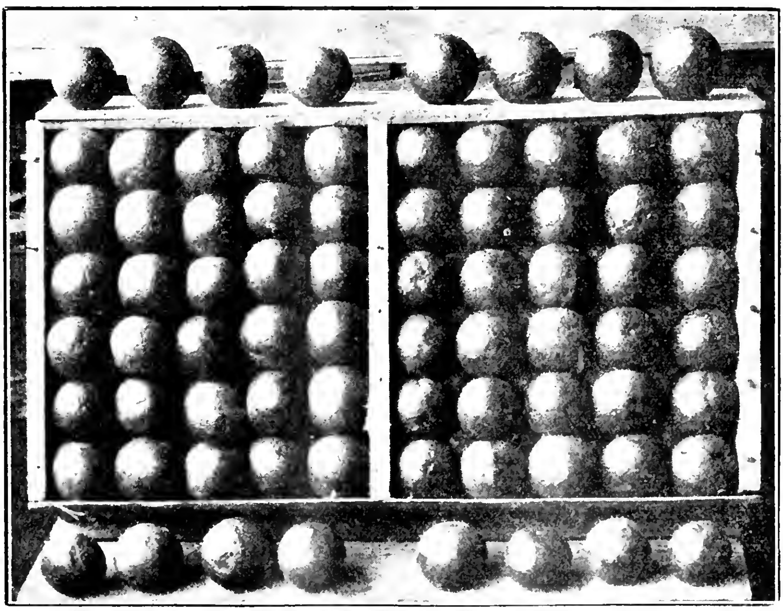


Plate II.—Same case, re-packed, apparently in same manner. but containing only 136 oranges.

be victimized when purchasing. It is quite a common practice amongst certain sections of the distributors to purchase a quantity of first-grade

fruit and mix this with fruit of a lower grade, the whole being put up for market in such a way as to deceive the unwary purchaser into the belief that he is obtaining fruit of a higher grade than is actually the fact. It must be remembered that the grower, in transactions of this nature, has less chance of success than the middleman, as the grower is selling to the middleman, who is an expert in the business of buying and selling fruit; whilst the middleman, or the retail middleman at any rate, is selling to a member of the general public, who is unacquainted with the tricks of the trade.

How Fruit may be Repacked to Deceive Purchaser.

Another practice, very common amongst certain sections of the trade, is to repack fruit in such a manner that, from an original purchase of, say, twelve cases, a total of thirteen, or perhaps more, cases may be made up.

To the uninterested, these thirteen cases appear properly packed or filled, although each case may contain perhaps 10 per cent. less than its original quantity of fruit.

This practice is especially prevalent in connexion with the sale of citrus fruits, as these, by their nature, are more easy to manipulate for this purpose than most other fruits.

Marking of Cases with Net Weight, Number, or Quantity Should be Enforced.

The provision for the indication of the net weight, number, or quantity of contents was included in the draft Regulations of the Fruit Act, for the purpose of defeating this practice, as this end cannot be attained by any other means. The fruit may be packed in standard bushel cases, and the faced or shown surface of the fruit may be typical of the contents of the whole package, but despite these facts, the purchaser will not be receiving full value.

Plate I. shows a case of oranges properly packed and graded, which contains 152 oranges. Plate II. shows the same case repacked in the manner indicated. To all appearances, the case shown in Plate II. is honestly packed and well filled with fruit, yet it contains only 136 oranges, or 16 less than the case shown in Plate I.

Present Legislation Powerless to Prevent Dishonest Repacking of Fruit.

As oranges are frequently worth 10s. a bushel or more, and as a fast packer easily can pack and nail six cases per hour, it will be readily understood that the practice well repays the time and trouble of repacking. Until the packing and grading of fruit under the diagonal numerical system is enforced by legislation, the practice may be continued with impunity, as neither the Fruit Cases Act nor the Fruit and Vegetable Packing and Sale (Topping) Act are sufficiently wide in their scope to deal with the matter. This leads us to a consideration of the attempts which have been made during the past few years to remove, by legislation, the disabilities under which the fruit industry has laboured.

History of Legislation (Vegetation Diseases Acts).

For this purpose, a short summary of the different Acts will be given, with brief remarks bearing on their principal provisions, and the reasons for their enactment.

In 1896, the first Vegetation Diseases Act came into force. This Act was intended to check the spread of insect and fungus diseases already established within the State, to prevent the further introduction from other States or countries of these diseases, and also the introduction of diseases not yet recorded for this State.

As legislation of this nature was then largely experimental, the Act was introduced for a term of three years only. Its operation, however, was found to be so beneficial that, at the end of the term, it was permanently re-enacted, and has remained in force ever since.

It was found, however, that its provisions with respect to the sale and distribution of disease-affected fruit were not sufficiently wide, and an amending Act for this purpose was introduced in 1901.

The Act was further amended in 1906 to enable a more rigid inspection of imported fruit and plants, and to provide for treatment of diseased consignments.

The Vegetation Diseases Acts were, so far as the inspection and treatment of plants and fruit imported from oversea countries is concerned, superseded in 1908 by the Commonwealth Quarantine Act; but the Vegetation Diseases Act still regulates the importation of plants and fruits from other Australian States, as well as matters pertaining to vegetation diseases within the boundaries of the State itself.

Beneficial Effects of Vegetation Diseases Acts.

The three Vegetation Diseases Acts have proved of the utmost value in preventing the production, sale, and distribution of diseased fruit, as any one who has been connected with the industry for some years can testify.

Somé fifteen years ago, apples affected with "black spot" or "codlin moth," and oranges infested with "red scale," "black spot," "false melanose," and other diseases, were much commoner on our retail markets, hawkers' barrows, and in retail fruit-shop windows, than at present, and it cannot be denied that the quality of our fruit, both locally-grown and imported, has been vastly improved as a result of the legislation mentioned.

According to an article in the *Popular Science Monthly* (New York), the undertaking recently established in California for obtaining supplies of potash from seaweed is proving so successful that one firm alone is producing three times as much potash as was previously imported from Germany. The kelp is cut by means of a reaper, which cuts the weed 4 feet below the water. The kelp is carried from a boat-harvester by a continuous belt elevator to a crushing mill. It is stated that sufficient potash is being obtained by these means to supply, not only American needs, but also those of all the Allies.

ACCIDENTAL ABORTION IN DAIRY CATTLE.

By W. F. Beacom, Dairy Supervisor.

Disease in stock is feared by all farmers, but naturally it is held in awe by those who have had experience of its scourges.

Drought and flood can in some measure be guarded against; ordinary sickness of individual animals can usually be cured, or, at the worst, causes only isolated deaths; but a visitation of contagious or infectious disease may reach even the best-tended herd, and result in heavy monetary loss to the owner. No matter how careful an owner may be in building up his herd, there is always the danger of disease being introduced by contact with a less careful neighbour's cattle or with straying stock. A very unfortunate instance of the introduction of disease some eight years since into a herd of 200 dairy cattle may be mentioned. Actinomycosis (lumpy jaw) was unknown in the herd until a stray bullock affected with the disease broke into one of the paddocks. The pasture was thus infected with the discharge from the abscess of the diseased animal, and since then recurrence of the disease has been common, and the consequent losses have brought home to the owner what initial neglect of contagion means.

All stock-keepers, whether dairy farmers or graziers, should make themselves conversant with the symptoms of the common complaints of cattle. Then, should they be unfortunate enough to have an animal attacked by any of these diseases, they will be able to take the required preliminary measures, and, if necessary, report to a competent authority.

The Veterinary Staff of the Department of Agriculture will always advise owners as to the necessary precautions to take in case of an outbreak of disease.

Notwithstanding this, however, owners frequently see several animals die without reporting the matter, and meanwhile the disease may have become so widespread that a heavy loss inevitably results, much of which could have been prevented if professional attendance had been obtained at the outset. Sometimes a secretive owner endeavours to sell his cattle when he finds they are diseased. To trade off a jibbing horse or an indifferent milking cow is by some regarded as a "bit of smart business." This is not the place to discuss the morality of such actions; but the sale of cattle suffering from any notifiable disease is an offence —a crime—that cannot be too often or too severely denounced. Such an act is almost sure to result in heavy loss to the unsuspecting buyer, or, may be, his absolute financial ruin.

Some diseases are of such an insidious nature, owing to the long incubation period of the germs, or the presence in the herd of a "carrier," that they may be very strongly established before the owner is aware of it. Two diseases especially are much to be feared by dairymen on this account, viz., pleuro-pneumonia and contagious abortion. The symptoms and treatment for combating each have previously been dealt with in this *Journal,* the latter disease being discussed at some length in the issue for June, 1916, a copy of which issue every farmer should keep at hand for ready reference.

Frequently, however, it is found that dairymen are apt to confuse contagious abortion with the simpler form of this disease, which is the

result of injury. A few of the possible causes of premature calving may well be noted, in order that they may be guarded against. The value of each cow to the dairy farmer is almost wholly dependent on the animal bearing a calf and renewing her milk each year. With breeding stock the value of the calf alone is in itself a big consideration, but in the case of a herd where several cows slip or abort their calves, and consequently do not come into their milking flush, the financial loss is very heavy. This is a fact too often overlooked, and, owing to failure to recognise its importance, farmers are apt to be less mindful of the causes leading up to it.

Almost every dairy farmer suffers an occasional loss through some cows slipping their calves, and many of these accidents might be prevented if the owner only knew the predisposing causes. Unless cows are dehorned, they will always fight more or less, and injure each other, and a rush in the flank may easily bring about slinking. The introduction of a strange cow into a herd of springers and milkers will almost always be followed by fighting, and ripped flanks or torn udders will probably result. Everything likely to lead to quietness in dairy cattle should be looked to. No cow should be roughly driven. The farmer who "dogs" his herd to or from the sheds is employing one of the most expensive of helpers. A proof of the folly of seeking its help may be given. A herd of fifteen cows was repeatedly "dogged" from the sliprails leading to a small paddock of greenstuff, from which they were cut a small quantity daily, and this treatment caused every one of them to cast her calf prematurely. Rough handling of the dairy herd is invariably very costly to the owner. Loss of milk and butter-fat is sure to result from rough driving, and, with cases of abortion possible, every owner should see that this sort of treatment does not occur.

Careless leg-roping of a nervous cow may also cause abortion. Some milkers rope every cow up tightly before they start milking, and timid or otherwise highly-sensitive cows are apt to resent this treatment. They will often kick continuously in an endeavour to get rid of the leg-rope, and thus irritate a cross-tempered milker, who may foolishly give the animal a blow in the flank. Such ill-treatment may easily lead to premature calving. (The most effective method of roping a cow to keep her from kicking is to fasten the leg with which she kicks short across the other. She simply cannot kick from that angle, but roping straight back does not prevent kicking.)

Slippery floors in the gangway or stalls are also frequently the cause of springing cows getting injured by falling on them, and subsequently slinking.

Allowing cattle to have access from one paddock to another through an awkward gateway, or over a log or partly broken rail or wire fence, may also cause similar trouble.

Again, cows are frequently injured at the stock watering places. Too many cows trying to drink at a small trough is sure to lead to fighting. It is a wise policy to make provision for all the herd being able to get to water and having their fill within at least half-an-hour. Timid cows, stock new to their surroundings, and small heifers are frequently crowded away from the water by the more robust cows for over an hour in the heat of a summer's day. The milk yield suffers in consequence, for, in hot weather, a full supply of wholesome water is as important as good feeding. Another source of injury to springing cows which may

easily pass unnoticed is found on farms where the stock drink at a running stream. If the banks are at all soft, the cattle soon cut tracks down to the water, and it is quite common for such tracks to be from 2 to 3 feet deep and yet no wider than the ordinary cow track. Cows heavy in calf going up and down these to water, even if taking their own time, are very apt to get bruised in the flank by knocking against the sides of the hollows. If they hurry, or are bustled in any way at watering time, the risk of injury is, of course, so much greater. One instance of this danger came under notice where quite a number of cows in the herd had aborted before the cause was discovered, but as soon as the tracks down the creek banks were widened by a few blows with a pick there were no more cases of slipping the calf. Even compelling cows heavy in calf to scramble up and down the steep bank of a creek is liable to result in some of them aborting. Unavoidable accidents are liable to occur only too often in any herd, and if a dairy farmer is careless enough to add to these by permitting his springing cows or heifers to take preventable risks, he deserves little sympathy.

Ergot—a parasitic plant-growth—has long been knows as causing abortion through cattle eating it, and possibly this trouble may also be brought on at times by the injudicious feeding of highly-forcing and fermented food.

Care should always be taken to destroy a fœtus or slink, and the ground where it fell should be disinfected. The hind-quarters and udder of the cow ought to be cleansed, and the womb flushed out with a disinfectant. These precautions should be taken in *all* cases of abortion. The owner cannot afford to run any risk of possible infection, even if he is satisfied that the slipping is the result of accident. Where there is the barest possibility of infection, every endeavour must be made to prevent it. An hour spent in thoroughly cleaning up every possible source of infection may prevent a subsequent loss of many pounds cash. Prevention of disease by reasonable precaution is the least expensive method of combating it.

HOW TO MAKE HOME-MADE CHEESE.

By G. C. Sawers, Cheese Expert.

1. For making a small quantity of milk into cheddar cheese, the following articles are required:—

(*a*) A wooden tub (or a jacketed vat) with movable canvas cover.
(*b*) A long-bladed knife.
(*c*) Cheese moulds.
(*d*) Cheese press.
(*e*) Thermometer.
(*f*) Curd rake.
(*g*) A 1-oz. and a 6-oz. measure glass.

2. When both the evening and the following morning's milk is to be used in the one operation, it is advisable to cool the evening milk (early after milking) by standing it over night in cold water.

3. Stir this milk occasionally till bedtime.

4. In the morning (before the morning's milk has been added) skim the evening's milk.

5. Add the starter* to the skim milk (1 oz. to every 10 gallons).

6. Heat the cream (by standing in hot water) to about 80° Fahr. and remix with the milk in the vat, stirring thoroughly.

7. Add the uncooled morning's milk. (When mixed the temperatures of the whole milk in the vat should be 84° to 86° Fahr.)

8. If coloured cheese is desired annatte should now be added and stirred gently for two or three minutes—a quarter or half-teaspoonful to every 10 gallons.

9. Now ascertain by the following test whether the milk is ready for the rennet:—

> The milk in the vat should be about 85 degrees of temperature. Take 4 ozs. of the milk in a cup and float a tiny wooden chip (bit of wooden match) on the milk; noting the position of the seconds hand on a watch add 1 drachm of rennet; stir immediately for 10 seconds; then withdraw the spoon and note carefully the time of coagulation. (Coagulation is indicated by the chip becoming stationary.) If coagulation occurs 18 to 20 seconds after the introduction of the rennet, the milk is ready for renneting without delay. If a longer time elapses the milk is not yet ripe enough and some delay is necessary.

10. Assuming the test shows the milk to be ripe, note the time and add the rennet—about $\frac{1}{2}$ oz. for every 100 lbs. (The amount of rennet is important, but as different milks vary in their curd content and different kinds of rennet vary in strength, the exact amount can only be arrived at by experience.) The rennet, before adding, should be diluted —20 parts to 1 with clean cold water.

11. Stir the milk for three to five minutes after adding the rennet, and watch for the milk coagulating. When this occurs, carefully note the time, because the time which elapses between the adding of the rennet and the setting of the curd is the best guide when to cut the curd. (Coagulation should occur in 12 or 14 minutes.)

12. As soon as the milk shows the first indication of thickening, and time has been noted, place canvas cover over the vat.

13. The number of minutes which the milk took to curdle should be multiplied by $2\frac{1}{2}$, and the number of minutes in the result is the time to be allowed between coagulation and cutting. Thus, if it took 12 minutes to thicken, it should be ready for cutting 30 minutes after. At this stage the curd should split clean in front of the thermometer when inserted diagonally.

14. Cut with a long-bladed knife in strips $\frac{1}{4}$-inch apart lengthways. Then do the same crossways, so that the surface appears cut into $\frac{1}{4}$-inch squares. Uniform cutting is important. After cutting allow the curd to settle to the bottom of the tub for a few minutes, but dip off a portion of the whey and scald it up to 140° Fahr.

15. Stir the curd gently by hand for ten to fifteen minutes before applying the rake.

16. Add a little hot whey.

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* An article on the propagation of culture starters for Cheese-making was published in this Journal for November, 1915.

17. Stir gently with rake and add whey every fifteen minutes, increasing the quantity of each application. While stirring continuously, the hot whey should gradually be raising the temperature required, viz., 96° Fahr. in warm weather, or 102° in cold weather, and this should be reached 40 to 45 minutes after stirring commenced.

18. Except during an occasional stir to prevent consolidation, it should be now left covered up with the canvas to maintain the temperature (96°-120°) till it is time to run off the whey. This is ascertained by the hot iron test, as follows:—Heat a piece of iron rod or pipe, not red, but hot enough to make water sizzle when dropped on it. Take some curd in the hand and squeeze tightly to press out the whey. Gently apply the iron rod to this curd for a few seconds and lift slowly away, observing while doing so the adhesive properties of the curd. If the curd adheres to the iron, and draws out in short fine silky threads ⅛-inch long, it is at the right stage for running off some of the whey (enough to expose the curd). With good milk the first whey is usually run off two and a half to three hours after the adding of the rennet. If curd is not ready for de-wheying in three hours, a faulty cheese is almost certain to result. If ready earlier than two and a half hours, a pasty cheese may be expected. The remainder of the whey may be drained off when another test of the hot iron produces threads ¼-inch long.

19. Gather the curd 6 to 8 inches deep, and tilt the vat for better drainage. Allow the curd to remain so stacked to become solidified (this process is called matting) for a quarter of an hour, when it should be cut to its full depth, lengthways and across, into junks abou 9 inches by 4, and turned completely over. Repeat the turning every quarter of an hour, the temperature being maintained evenly—94 or 96 degrees—until the curd becomes tough or meaty, usually about two hours after the stacking. (The frequent turning insures even drainage and uniform colour.) Again apply the hot iron test to the curd, and threads should draw out ¾ to 1 inch long. If this occurs, the curd is ripe for milling.

20. Milling may be done, with small quantities, with an ordinary carving knife, with which cut the junks into cubes of ½-inch dimensions. It should then be stirred every quarter of an hour, but always cover when not stirring, as the heat should be maintained at about 95°.

21. One hour from milling apply the hot iron test again. If curd pulls out in threads 1½ inches it is ready for salting. At this stage the curd assumes a peculiar velvety feeling, and when compressed in the hand exudes moisture composed of equal parts of whey and butter fat. Salt at rate of about 4 ozs. per 10 gallons of milk, but add only half the amount at one time, and stir thoroughly before adding the remainder. Mix well and leave curd massed up for fifteen minutes. During the process of salting the temperature may be permitted to fall, and at completion should be 84°.

22. Pack the curd firmly into the mould, in which cheese cloth has been inserted. When filled, lap the cloth over the ends. Put wooden follower on top and place in press. Apply pressure gradually until whey ceases to escape. Then remove cheese from mould, lift loose ends of cloth from top, draw out the wrinkles, and insert disc of muslin on top. Lap loose ends over again and place back in press. Gradually increase pressure until late at night, when it may be left. Remove cheese from mould next morning, and place in storing room, where temperature should not exceed 60%. Stand on clean shelf, and turn over daily for two months, at which time it will be ready for use.

VICTORIAN RAINFALL.

First Quarter, 1918.

District.	—	January.	February.	March.	Quarter.
		Points.	Points.	Points.	Points.
Mallee North	District Mean.. ..	46	65	141	252
	Normal	55	64	112	231
	Per cent. above normal	..	2	26	9
	„ below „	16	..	..	..
Mallee South	District Mean.. ..	66	187	166	419
	Normal	57	74	98	229
	Per cent. above normal	16	153	69	83
	„ below „	..	..	..	..
North Wimmera ..	District Mean.. ..	69	134	88	291
	Normal	64	69	95	228
	Per cent. above normal	8	94	..	28
	„ below „	..	..	7	..
South Wimmera ..	District Mean.. ..	80	88	86	254
	Normal	93	76	109	278
	Per cent. above normal	..	16	..	..
	„ below „	14	..	21	9
Lower Northern Country	District Mean.. ..	305	180	258	743
	Normal	90	81	116	287
	Per cent. above normal	239	122	122	159
	„ below „	..	..	..	..
Upper Northern Country	District Mean.. ..	340	176	267	783
	Normal	116	95	135	346
	Per cent. above normal	193	85	98	126
	„ below „	..	..	..	..
Lower North-East ..	District Mean.. ..	385	195	224	804
	Normal	154	138	224	516
	Per cent. above normal	150	41	..	56
	„ below „	..	..	..	..
Upper North-East ..	District Mean.. ..	442	124	369	935
	Normal	217	207	277	701
	Per cent. above normal	104	..	33	33
	„ below „	..	40	..	..
East Gippsland ..	District Mean.. ..	292	239	337	868
	Normal	256	223	241	720
	Per cent. above normal	14	7	40	21
	„ below „	..	..	..	..
West Gippsland ..	District Mean.. ..	301	144	430	875
	Normal	229	168	274	671
	Per cent. above normal	31	..	57	30
	„ below „	..	14	..	..
East Central	District Mean.. ..	216	113	457	786
	Normal	233	174	274	681
	Per cent. above normal	..	..	67	15
	„ below „	7	35	..	..

VICTORIAN RAINFALL—*continued.*

District.	—	January.	February.	March.	Quarter.
		Points.	Points.	Points.	Points.
West Central	District Mean.. ..	95	78	334	507
	Normal	146	130	208	484
	Per cent. above normal	..	..	61	5
	,, below ,,	35	40	..	..
North Central ..	District Mean.. ..	173	88	337	598
	Normal	130	122	173	425
	Per cent. above normal	33	..	95	41
	,, below ,,	..	28	..	..
Volcanic Plains ..	District Mean ..	90	64	183	337
	Normal	139	114	176	429
	Per cent. above normal	..	..	4	..
	,, below ,,	35	44	..	21
West Coast	District Mean.. ..	89	109	117	315
	Normal	148	124	198	470
	Per cent. above normal	..	..	..	..
	,, below ,,	40	12	41	33

N.B.—100 points = 1 inch.

HOW TO MAKE WASHINGTON LIMEWASH.

Slake a bushel of quicklime in a barrel, covering with a bag while the lime is working; melt 1 lb. common glue to a thin size; make $1\frac{1}{2}$ lb. ground rice into a thin paste with boiling water; mix up 1 lb. of whiting as you would mustard. When the lime is quite slaked, add the glue, whiting, and rice paste, and a half-peck of common salt. Mix well, and let stand for 48 hours, keeping covered. Thin down to consistency of ordinary whitewash, and apply hot.

Another Method.

Slack half-a-bushel of lime in boiling water, cover during the process, to keep in steam. Strain this through a fine sieve or strainer, and add to it a peck of common salt, previously dissolved in warm water, and 3 lbs. of ground rice, boiled to a thin paste, and stirred in while hot. Add also $\frac{1}{2}$ lb. of Spanish whiting and 1 lb. of glue, previously dissolved by soaking in cold water, and then melted in a glue pot. Add 5 gallons of hot water to the mixture, and stir well. Let it stand a few days, protected from dirt, and apply hot.

A FEW HINTS ON THE FEEDING OF HORSES.

By W. M. Lerew, G.M.V.C., Veterinary Officer.

Inquiries regarding the feeding of horses are often made by people new to farm work, and it is with the intention of helping the novice that these notes have been written. There is a right and a wrong way of doing most things, and in the feeding of horses, the right way means an improved condition of the animals and a corresponding increase in the work done by them; whilst the alternative is animals in low condition or ill-health, and no matter how willing they may be, they are physically unfit to do the same amount of work as horses that are properly fed.

The first and most important matter to attend to is to see that the horse's teeth are in proper condition, so that when he is supplied with feed he will be able to masticate it properly. There are several signs which point to the teeth being out of order, such as dropping food when eating, excessive noises from the sharp edges of the teeth grinding together, or else no noise at all—showing that the grain is not being crushed. Failure to masticate the food means that the full amount of nutriment will not be extracted therefrom; proper digestion will not take place, followed by loss of condition, and probably attacks of colic, and at the same time, great pain from the sharp edges of the teeth lacerating the tongue and cheeks.

In order to examine the teeth of a horse a gag should be placed in his mouth and any irregularity corrected by the careful use of a tooth rasp.

Regarding the feed itself, only one quality should be purchased, and that the best, which is the cheapest in the end, for a smaller quantity will supply the requisite amount of nourishment, and keep the horse in better health.

The staple diet of a working horse should consist of chaff, oaten or wheaten, the former for preference, oats, bran, and oaten hay, varied by an occasional feed of sliced carrots, lucerne, fresh or dried, green stuff, such as green barley, oats, &c. Owing to the small size of the stomach of the horse, the feed should be rich and not too bulky, which will allow it to remain long enough in the stomach for partial digestion, instead of over-flowing into the bowel too soon.

When a horse is turned out at grass, no other feed is necessary, unless there is a shortage of grass, when a little may be necessary. On bringing the animal into the stable for work, some care is necessary, as a sudden change to dry fodder is harmful. For a few days the feed should consist of chaff and bran well damped, and without the addition of any grain. At first the work should be light and the horse's muscular condition hardened. Grain may be given gradually till the animal is on a full ration. If low in condition, steamed barley or oats should be mixed with the chaff and bran, and sliced carrots given for a change. Lucerne chaff (soaked previously in water over night) may be mixed with, or substituted for, the oaten chaff. When an animal is stable fed, light work or regular exercise is essential and helps to improve the condition.

Regular feeding is another important point to be noted. Four feeds a day ought to be given, the first being put in the feeder early enough to allow of its being finished before harnessing up. The first

three feeds, given early in the morning, noon, and after work is finished, may consist of chaff 5 lbs., oats 3 lbs., bran 1 lb., per feed, for each 1,000 lbs. weight of the horse. It is a good plan to give a feed of hay last thing at night, as it takes the animal longer to eat this, and keeps him contented through the night. If the chaff be dry and dusty, it is advisable to damp it slightly. If the feed be damped, care must be taken that the feeders are always thoroughly clean, as any damp bran that is left will quickly sour and spoil the next feed. Horses should never be given as much as they can eat, as over-feeding will tend to set up digestive troubles, indicated by colic, skin eruptions, loss of appetite and sluggishness. Rather give them a little less, and they will be ready for the next feed. If resting in the stable instead of working, immediately reduce the oat ration and make up with extra chaff and bran. Some horses eat less than others of the same weight; therefore measure out their feed accordingly, and it will be worth the little extra trouble involved.

A lump of rock salt in the feeder is greatly relished by the majority of horses and is very beneficial.

Two or three packets of Epsom salts, dissolved in a little water, and mixed with the feed, if given occasionally, will act as a laxative, and improve the general standard of health.

Watering.—Undoubtedly the best time to give a horse drink is before he is fed, because, if watered just after feeding, a lot of undigested food is washed out of the stomach into the intestines, and may give rise to an acute attack of indigestion or colic. Always allow the horse to have a plentiful supply of cool, clean water, and if a trough or tub be used, keep it clean, and in a shady place.

Stallion Feeding.—Stallions suffer more from injudicious feeding than any other horses, and the results are very noticeable, especially in draught stock. Swollen and thickened hocks, often badly scarred in front where they have broken out, thickened legs, and pasterns disfigured by greasy swellings, are only too common. This is caused by over-feeding on rich heating food, insufficient exercise, and the want of laxative diet. Every stallion owner naturally likes to see his horse in good condition, and generally tries to put this on too quickly at the beginning of the season, by over-feeding.

The horse should be gradually brought on to the hard grain diet, and always be given a ration of carrots, green lucerne, &c., along with the other feed. Laxative doses of Epsom salts occasionally, and plenty of walking exercise, are very necessary.

The following is the scale of feeding for Australian military horses:—

—	Scale I. Light Horses.		Scale II. Medium Draught.		Scale III. Heavy Draught.	
	In Stables.	In the Open.	In Stables.	In the Open.	In Stables.	In the Open.
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
Oats ..	10	12	10	12	14	14
Chaff ..	8	12	12	14	12	14
Hay ..	6	..	4	..	4	..
Bran ..	1	1	1	1	2	2
Straw (bedding)	7	..	7	..	7	..

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Pomologist.

The Orchard.

Cultivation.

Cultivation work should be well on the way by this time. The ploughing should be advanced, so as to leave plenty of time for other orchard work. Autumn ploughing may be rough, but care should be taken to plough to the trees, so that a drainage furrow is left between the rows.

Manuring.

It is just possible, where heavy crops have been carried, that a top dressing of stable manure will be required to add humus to the soil. The fertility of the soil must be maintained; and, although stable and chemical manures as a general rule are of undoubted value as tree stimulants, well-cultivated and thoroughly tilled land will always carry fair crops with far less manure. Further, if the orchard land is well drained, cultivated, and sub-soiled, any manures that are used will be far more beneficial to the trees. The more suitable the conditions that are given to the trees, the better they can appreciate and assimilate their food.

Perhaps the most useful and valuable of manures is stable manure. It is of great use, not only as a manure and as an introducer of necessary bacteria into the soil, but its value in adding humus to the soil is incalculable. Organic matter, such as stable manure, introduced into the soil quickly becomes humus; this greatly ameliorates and improves soil conditions. It is impossible to say what quantity of stable manure is necessary per acre; that can be determined only by circumstances. Orchards in different climates and varying soils will require differing quantities. A too liberal use of stable manure will be over-stimulating in most cases, and at all times an excess beyond what is necessary for present use will only be waste, as humus is readily lost from the soil, once it is in an available food form.

It has been pointed out in these notes previously that an improved physical condition is far more profitable to the fruit-grower than the continued use of manures. A tree will be far more productive if it is happy in its soil conditions; uncomfortable conditions will always result in unprosperous trees.

A dressing of lime, using about 4 or 5 cwt. per acre, is of great value in stiff or heavy orchard lands; and it may be given at this season. The lime, which must be fresh, should be distributed in small heaps between the trees, covered with a layer of soil, and allowed to remain for a few days before ploughing or harrowing in.

Pests.

The advice given last month for spraying should be followed, particularly where any oil emulsions or washes are to be used.

Orchards will benefit if an attack is now made upon the Codlin moth. All hiding places, nooks, and crannies, where the larvæ have hidden, should be thoroughly searched and cleaned out. The orchardist has far more time now to do this work than he will have in the spring time.

GENERAL WORK.

Drainage systems should now be extended with as little loss of time as possible.

New planting areas should be prepared, and subsoiled or trenched wherever possible.

Vegetable Garden.

Weeds must be kept down in the vegetable garden. Weeds are generally free growing at this season; their growth is very insidious, and they will crowd out the young seedlings or plants in a very quick time. Hoeing and hand weeding must be resorted to, preferably hoeing. The frequent use of the hoe in winter time is of much benefit in the vegetable garden. A varied assortment of crops is now being produced; and if these can be kept growing much better crops will result. The soil quickly stagnates in the winter, and the only way to prevent this is to keep the surface stirred. Thus, a double service is performed with the aid of the hoe.

The application of lime is of great necessity at this season. In addition to amending unhealthy and unsuitable soil conditions, lime is particularly useful as an insecticide. It assists in destroying in immense numbers both eggs and insects that would breed and live in the ground ready to do damage to all classes of vegetable crops. Therefore, wherever possible, the soil should receive an application of lime. The garden should, as well, be manured with stable manure, but not for some weeks after the lime application.

Cabbage and cauliflower plants may be planted out; and seeds of parsnips, carrots, onions, peas, and broad beans may be sown.

Flower Garden.

The whole flower section should now be thoroughly dug over. All beds should be cleaned up, top-dressed with manure, and well dug. The light rubbish, such as foliage, twiggy growths, weeds, &c., may all be dug in, and they will thus form a useful addition to the soil. These should never be wasted. Only the coarser and stouter growths should be carted away for burning, and then the ashes may be used as manure. No part, whatever, of garden rubbish or litter need be wasted. In one form or another it should be replaced in the soil.

May is a good month for establishing new gardens, and for planting out. All deciduous plants and shrubs may now be planted. It is not necessary to dig a deep hole for planting. A hole in which the roots of the plant can be comfortably arranged, without crowding or cramping, will be quite sufficient for the purpose.

Continue to sow seeds of hardy annuals, including sweet peas, although the main crop of sweet peas should by this time be well above ground. Where there has been any overplanting, the young plants will readily stand transplanting, and this will greatly assist those that are to remain. Annuals should not be crowded in the beds. They require ample room for suitable development, and thus the seeds should be sown thinly or the plants set out a good distance from each other.

All herbaceous perennials that have finished blooming may now be cut down. Included amongst these are phlox, delphiniums, &c. If these are to remain in their present situation for another season it is always an advantage to raise them somewhat, by slightly lifting them with a fork, so that too much water will not settle around the crowns; they may also be mulched with stable manure, or the manure may be forked into the soil around the crowns.

REMINDERS FOR JUNE.

LIVE STOCK.

Horses.—Those stabled and in regular work should be fed liberally. Those doing fast or heavy work should be clipped; if not wholly, then trace high. Those not rugged on coming into the stable at night should be wiped down and in half-an-hour's time rugged or covered with bags until the coat is dry. Old horses and weaned foals should be given crushed oats. Grass-fed working horses should be given hay or straw, if there is no old grass, to counteract the purging effects of the young growth. Old and badly-conditioned horses should be given some boiled barley. Paddocked horses should be looked at from time to time to ascertain if they are doing satisfactorily.

Cattle.—Cows, if not housed, should be rugged. Rugs should be removed and aired in the daytime when the shade temperature reaches 60 degrees. Give a ration of hay or straw, whole or chaffed, to counteract the purging effects of young grass. Cows about to calve, if over fat, should be put into a paddock in which the feed is not too abundant. If in low condition feed well to tide them over the period and stimulate milk flow. It should be borne in mind that the cows most liable to milk fever are those that have been low in condition and are rapidly thriving. The treatment described in the *Year-Book of Agriculture*, 1905, should be almost invariably successful. It will generally be found most profitable to have cows calve in autumn. They will then pay well for feeding through the winter, and will flush again with the spring grass. Calves should be provided with warm dry shed. Cows and heifers for early autumn calving may be put to the bull. Observe strict cleanliness and regularity with regard to temperature and quantity of feed to avoid losses and sickness incidental to calf rearing.

Pigs.—Supply plenty of bedding in well ventilated sties. Sows in fine weather should be given grass or lucerne run. Bulletin on the Pig Industry is now available.

SHEEP.—Clear muck-balls from tails and legs of all sheep. Have the wool cleared from round udders and eyes of all young lambing ewes, and see them first thing every morning. Mark the ram lambs at earliest chance. Cut off ewes with oldest wether lambs to best pasture or fodder crops.

Sheep with overgrown hoofs are unthrifty. Whenever noticed trim back into shape; they cut easily during winter. If left, are conducive to lameness, and even foot rot. In the case of common foot rot, or scald, the feet can be placed in a thick paste made of lime and boiling water. Obstinate cases of long standing may need more drastic remedies, and persistent attention. In all cases pare away all loose portions, and leave the diseased parts clearly exposed.

Foxes are more ravenous during winter months. Sparrows, starlings, and parrots are good bait. Poisoning lambs already killed usually accounts for scavenger foxes only.

Every fox is not a lamb killer. Remove all lambs for two or three nights if at all possible, and birds then will rarely fail to entice Reynard the second or third night.

Powdered strychnine, just sufficient to cover nicely a threepenny-piece, is the usual dose. On the more valuable lambs fix a light tin collar, cut from 2 inches wide at the top of the neck to 3 inches wide below, fastened underneath in one place only, near the breast, with fine wire, and lying open towards the throat, allowing the lamb to both suck and feed. It should be cut as large as possible, yet not large enough to permit of its falling off over the lamb's head. This makes a guard that rarely fails to prevent a fox getting to the main blood vein. Remove the guards when the lambs are about eight weeks old.

POULTRY.—Supplies of shell grit and charcoal should always be available. Sow a mixture of English grass and clover; this not only removes taint in soil but provides excellent green fodder for stock. Where possible, lucerne and silver beet should now be sown for summer feed; liver (cooked) and maize aids to egg production during cold weather. Morning mash should be mixed with liver soup given to the birds warm in a crumbly condition. All yards should be drained to ensure comfort for the birds.

CULTIVATION.

FARM.—Plough potato land. Land to be sown later on with potatoes, mangolds, maize, and millet should be manured and well worked. Sow malting barley and finish sowing of cereals. Lift and store mangolds, turnips, &c. Clean out drains and water furrows. Clean up and stack manure in heaps protected from the weather.

ORCHARD.—Finish ploughing; plant young trees; spray with red oil or petroleum for scales, mites, aphis, &c.; carry out drainage system; clean out drains; commence pruning.

VEGETABLE GARDEN.—Prepare beds for crops; cultivate deeply; practise rotation in planting out; renovate asparagus beds; plant out all seedlings; sow radish, peas, broad beans, leeks, spinach, lettuce, carrot, &c.; plant rhubarb.

FLOWER GARDEN.—Continue digging and manuring; dig all weeds and leafy growths; plant out shrubs, roses, &c.; plant rose cuttings; prune deciduous trees and shrubs; sow sweet peas and plant out seedlings.

VINEYARD.—Thoroughly prepare for plantation, land already subsoiled for the purpose. Remember that the freer it is kept from weeds from this forward, the less trouble will there be from cut-worms next spring. Applications for ungrafted resistant rootlings and cuttings must be made before the end of the month—see Journal for last month. Pruning and ploughing should be actively proceeded with. In northern districts plough to a depth of seven or eight inches. Manures should be applied as early as possible.

Cellar.—Rack all wines which have not been previously dealt with. Fortify sweet wines to full strength.

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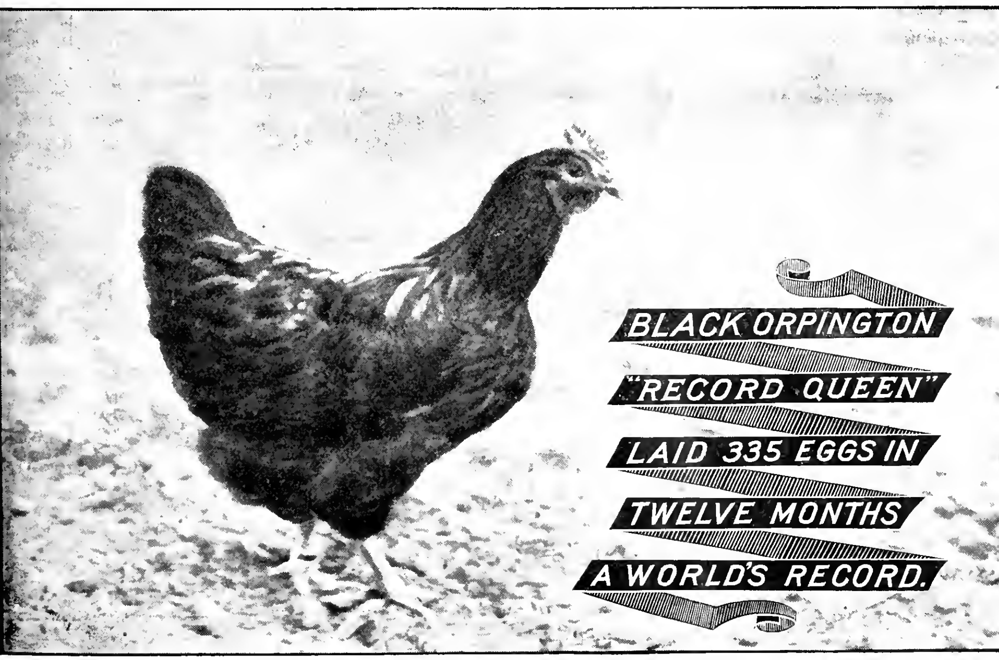
The Journal of The Department of Agriculture of Victoria, Australia.

June, 1918.



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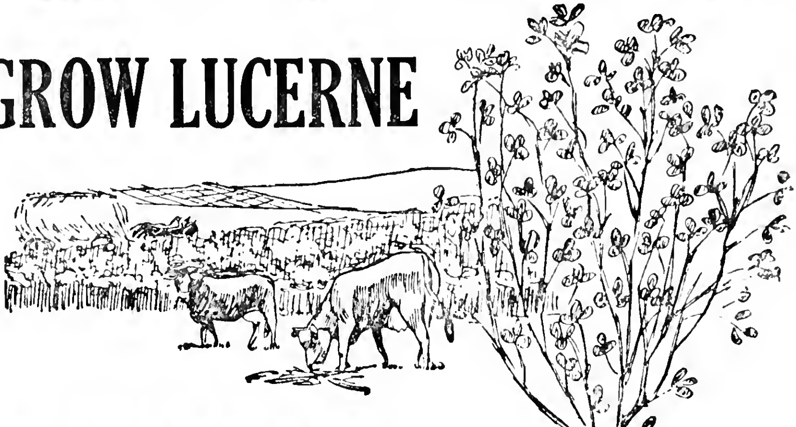

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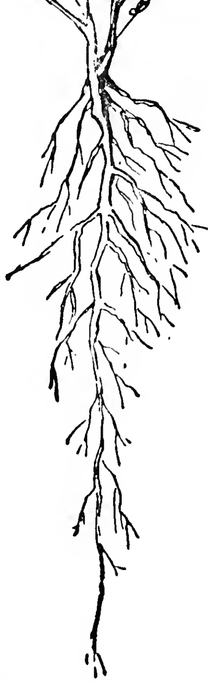

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THE JOURNAL

OF

The Department of Agriculture

OF

VICTORIA.

Vol. XVI. Part 6. 10th June, 1918.

REPORT ON THE SEVENTH VICTORIAN EGG-LAYING COMPETITION, 1917-18.

Conducted at the Burnley School of Primary Agriculture by the Department of Agriculture, Victoria.

By A. Hart, Chief Poultry Expert.

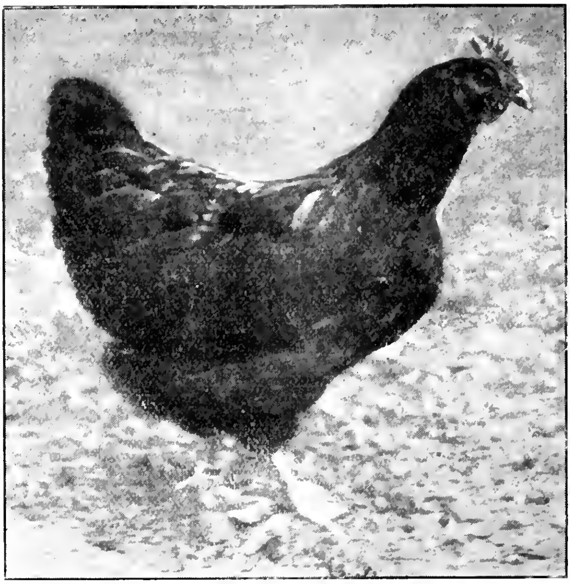
In presenting my report of the Egg-laying Competitions, concluded at Burnley in March last, there are a few matters, to which reference has not been previously made, that call for comment.

The decision to extend the competitions over a period of only eleven instead of twelve months, as formerly, will prevent comparisons of the figures for the last competitions being readily made with those of previous years.

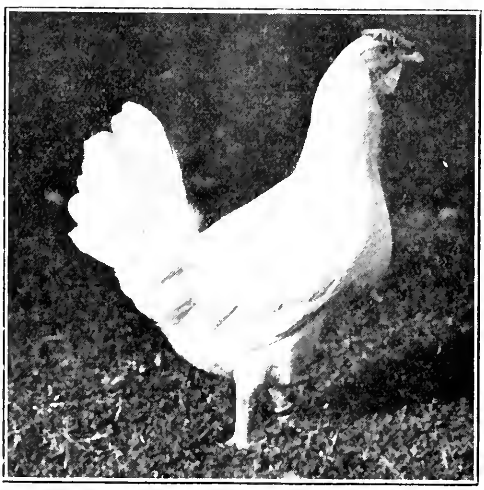
The most interesting result of the 1917-18 competitions is the performance of a Black Orpington hen, owned by Mr. C. E. Graham, which was entered in the Individual Orpington, Wet Mash Test, and which laid 307 eggs in the period of the competition, viz., eleven months. As it appeared likely that this bird would establish a new record if permitted to remain for a full year, arrangements were made accordingly. The result fully justified this confidence, for her total number of eggs for the twelve months, 335, is a world's record. This excellent result is all the more remarkable when it is remembered that the average weight of the eggs was approximately $26\frac{1}{2}$ ounces per dozen.

Another fine performance was that of a White Leghorn, belonging to Messrs. Rogen and Andrew, in the Wet Mash Test for Individual Leghorns. During the competition this bird laid 300 eggs, and, as it seemed probable that, if given the opportunity, her total for twelve months would exceed previous records for Leghorns, she was retained

at Burnley for a month after the competitions were ended. Unfortunately, just at the beginning of this month, the bird began to moult.



Mr. C. E. Graham's Black Orpington (laid 335 eggs in twelve months).

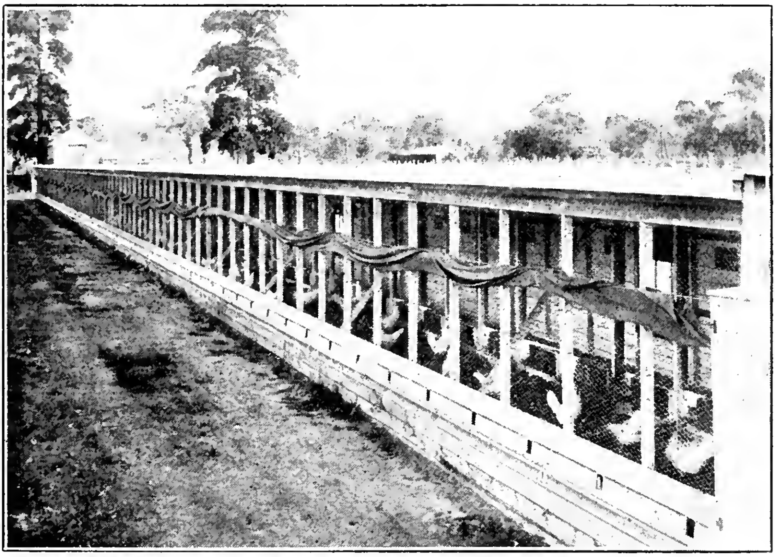


Rogen and Andrew's Winning Bird in Test for Highest Number of Eggs Laid during Competition.

Of course, her egg production then ceased, and only a single egg was added to her total for the eleven months of the competition.

The value of the tests at Burnley cannot be over-estimated. The weekly reports showing the results obtained in the several sections are read with interest by poultry-breeders, and the final figures are always waited for with very great interest. Records made at Burnley are of special interest to those interested in egg production, for the competitions, being carried out under the supervision of Government officials, the figures are unhesitatingly accepted as correct; and big prices have been paid, both in the Commonwealth and overseas, for birds that have been prominent in the tests.

It may be claimed for the competitions that they have done much to improve the laying qualities of fowls generally. If the figures of the last competition be compared with those of previous years, it will be seen that there has been an improvement in the quantity of eggs



Ideal Single Testing Shed at Burnley.

obtained, not only from the birds in the individual tests, but also from those entered in the pen competitions. This latter result is even more satisfactory than the establishment of a world's record by one bird, for the improvement shown in the several pens entered is bound to be reflected in the thousands of flocks throughout the State.

On comparing the returns from birds fed on different foods and kept under different conditions, it will be noticed that the best total average performance was made by single-pen birds. The highest number of eggs from a single fowl was also obtained from a single-pen bird. The average production from the whole of the single-pen birds of all varieties was slightly over 200 eggs per bird for the eleven months over which the competitions extended. The best results were yielded by Black Orpingtons, 39 of which gave an average return of 211 each. The breed giving second-best results was the White Leghorn (Wet Mash Section),

with an average return of 209 eggs from 54 birds. In the Dry Mash Section, 23 White Leghorns laid, on an average, 205½ eggs each during the competitions. In the class for those heavy breeds other than Black Orpingtons, which included Rhode Island Reds, Silver Wyandottes, White Plymouth Rocks, &c., 19 hens averaged 175 eggs each. From the light breeds other than White Leghorns, which included Minorcas, Spanish, and Anconas, an average of 150 eggs was obtained from 11 birds—one Minorca hen giving the very fine total number of 250.

In the various competitions for pens of six birds, White Leghorns were to the front. The birds in the Dry Mash Section, numbering 144, laid, on an average, 190.201 eggs each; and the average of the 264 in the Wet Mash Section was 190.178. This shows a slight margin in favour of the dry mash; but, as a much greater number of birds were fed on wet mash diet, the comparison is not on equal lines. Turning now to the heavy breeds, 120 birds in the Wet Mash Section averaged 169 eggs for the eleven months, and 48 fed on the dry mash principle gave an average of 157 eggs. The average yield of each bird in the teams competition, 576 in all, was 183. This is a very satisfactory result, more especially as, in making the computation, no deduction has been made for birds that have died or been withdrawn from the competitions.

The results of the recent competitions, as well as those of previous years, show that when birds become accustomed to being penned singly, their yield of eggs is not decreased. The conditions under which the birds are penned allow each bird to have a full view of the others on either sides, as only wire netting separates them. This, of course, is much better than if the partitions prevented the birds from seeing each other. For competitions, single-pen testing has been found the most satisfactory method—indeed, it is the only thoroughly reliable way of ascertaining the egg production of each bird. For the same reason, single-pen testing is equally valuable for the breeder desiring to select the eggs of his most productive fowls. A team of six birds may yield a big total return, but it may be that one of the team is an indifferent layer, and that, but for her presence, the result would have been still better.

Methods of Feeding.

The feeding of the birds which competed in the several tests in the last competitions was on lines which can be practised by almost any poultry-keeper.

The wet mash was composed (by measure) of two parts wheat pollard, two parts bran, one part pea meal, one part oaten pollard, and one part chaffed green-stuff (lucerne, clover, &c.), and to this was added a small ration of minced liver (about 5 per cent. of the whole). This feed was mixed to a crumbly consistency with liver soup, and a very little salt added. About 2 ounces of the mash was allowed to each hen for the morning meal, and a further ounce was given at mid-day. The grain ration, which formed the evening meal, consisted of six parts wheat, two parts oats, and one part crushed maize. About an ordinary handful of this was allowed for each bird, the amount being slightly varied at the discretion of the attendant. This mixture was fed to the birds in both the wet and dry mash tests.

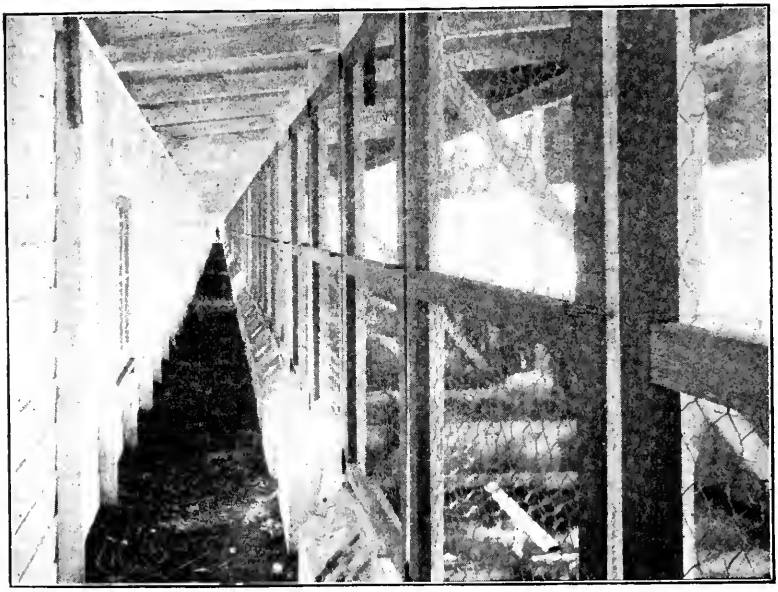
Green Food Essential for Poultry to insure Health and increase Egg Production.

Returned Soldiers cutting the First Crop of Green Barley for Fowls at Dookie Agricultural College.

Returned Soldiers cutting Rape at Dookie Agricultural College for Fowls.

The dry mash was made up of one and a half parts bran, one part pollard, half a part oaten pollard, one part green leaf (lucerne), and a third of a part pea meal. Boiled minced liver, at the rate of from 1½ to 2 ounces, was allowed daily to each pen of six birds. Greenstuff was fed liberally to all the fowls, supplies of lucerne, green maize, silver beet, rape, thistles, barley, and clover being given as available. Fresh water was always provided, and a regular supply of grit, shell, and charcoal was always before them.

The value of green food for poultry cannot be over-estimated. There is no doubt that its use increases egg-production; and, further, it will help to keep the birds in good health and condition. Suitable green food should always form a considerable portion of the daily ration. One has only to note the large quantity of green food which hens running in a paddock will eat daily, to understand the necessity for keeping penned fowls liberally supplied with lucerne, thistles, &c., &c.



Interior of one of the Fowl Houses at Burnley.

General Remarks on the Competition.

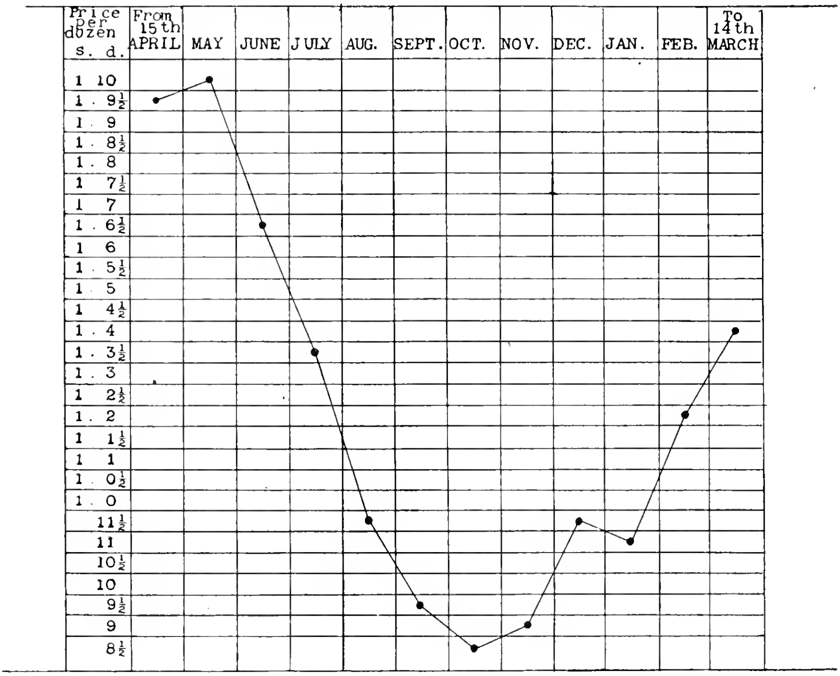
The total number of eggs laid by the 750 birds in the whole of the tests was 134,726, and, reckoning the average price as 1s. 3d. per dozen, the return may be roughly stated at £700.

The prize for the greatest number of eggs was won by Mr. C. E. Graham's Black Orpington hen, which produced 335 eggs. At an average price of 1s. 3d. per dozen, this number of eggs would have yielded £1 15s. The prize for a team producing the highest number of eggs went to Mr. G. McDonnell, whose six White Leghorns laid 1,405 eggs. At an average of 1s. 3d. per dozen, these eggs were worth £7 6s. 3d. For the heaviest average eggs laid by any pen, the prize was allotted to Messrs. Bennett and Chapman. Their team of Black

Orpingtons laid eggs which averaged, approximately, 25¾ ounces per dozen during the period of the competition; and the prize for the heaviest average eggs laid by any individual bird went to Mr. C. E. Graham, whose Black Orpington "Record Queen" laid eggs which averaged 26½ ounces per dozen. Though the actual average price realized for the eggs with delivery taken at Burnley was approximately 1s. 1d. per dozen, 1s. 3d. has been used for our calculations, except in the case of the eggs laid during the winter tests, as the equivalent of the market price (including cartage, delivery at the market, &c.).

A complete list of the prize-winners is given on pages 337-8.

HIGHEST WHOLESALE
MARKET PRICESOF EGGS FROM 15TH APRIL, 1917, TO 14TH MARCH,1918.



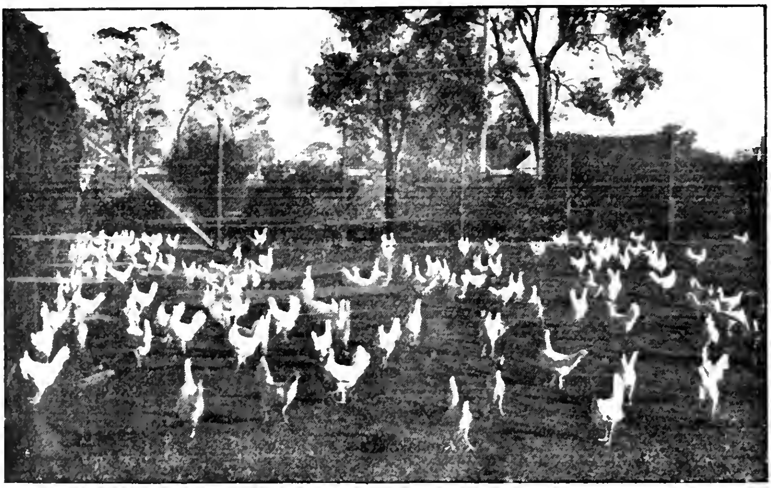
Necessity for Maintaining Type, &c.

The diversity in type and general appearance of some breeds, particularly the White Leghorns, competing in the tests now being conducted, may be easily noted. While breeders are justified in using every endeavour to increase egg production, they should also pay strict attention to the maintenance of type, according to the standards which are laid down for the different breeds. When type is not considered, there is undoubtedly a danger of the birds' constitutions being weakened, and this means ultimate disaster. A proof of the necessity for conforming to the type and character of the different breeds was given by an expert writer when commenting on tests recently held at Gatton College,

Queensland. He says, "The type of the competing birds was most variable, and shows most emphatically that severe steps must be taken to save some of the breeds from losing every resemblance to the standard. A number of the competitors seem to be under the impression that when more size and closer approach to the standard were asked for, what was required was the biggest, and often the coarsest birds they could find in their yards were sent along. The consequence has been more broodiness, bad laying averages, and keen disappointment."

Price of Eggs and Poultry.

The price of eggs is now very high, but as the season advances, large flocks of pullets and hens will come into full profit on the poultry-farms throughout the State. Almost every year, during the spring and summer months, the supply of eggs produced here is in excess of



Flock of Utility Pullets, hatched in September in order to avoid Second Moult and to insure Winter Eggs.

the quantity required to meet local normal needs. The graph on page 327 shows the highest wholesale price per dozen during the period of the last competitions at Burnley. From it the reader will see at a glance the high price of eggs from the beginning of the competitions in April, and during the month of May, and the gradual decline in the month of October, when eggs were worth only 8½d. per dozen.

The problem to be solved is how to dispose of the excess at a rate that will be satisfactory to the poultry-farmer. With new-laid eggs selling in England at 5d. each at present, it would seem that there is a market for Victorian surplus eggs; but, owing to the difficulties in transport now obtaining, the question of selling in the markets of the Mother Country must be held over. However, when peace once more returns, the matter of sending eggs overseas in cold storage is one that is certain to come up for consideration.

Between the English and Victorian prices for all classes of table birds there is a great difference. In our Melbourne markets, second-grade table birds, such as fat hens of first or second season, as well as first-class table poultry, may be purchased at a lower price per pound than beef or mutton. This fact alone shows that the poultry-farmer is scarcely obtaining as good a return from one branch of his industry as he might reasonably look for. No doubt, when the war is over, and shipping becomes normal again, much of our poultry will be sent to the other side of the globe, and, with this outlet, local prices will harden. A number of our returned soldiers have decided to become poultry-farmers, but it will be difficult for them to carry on the work with profit to themselves unless the sale of some of their produce overseas is assured.

Hints to Prospective Competitors.

When single birds are entered, there is not so much trouble for beginners to select birds for laying competitions as in the choosing teams of six pullets. Competitors in past tests have learnt, wholly or partly by experience, the best methods of selection; and, if new nominators wish to succeed, they must acquire this knowledge. A few hints on the subject, therefore, will not be out of place. When a pen of six is required, fifteen or sixteen birds of the same age and strain should be placed in an observation pen, where the number of eggs laid by each may be carefully noted. The poorer layers should be gradually culled out, and no doubt in two or three weeks the number remaining will be reduced to eight or ten. A little further observation will serve to show the best six, and these should be sent to the competition. Where single birds are to be entered, it is advisable to place pullets of varying ages and strains in the observation pen. While the birds are in the pens, they should be fed on similar lines to those followed at Burnley, so that when the competition commences the competing birds will not have to undergo a change in diet. Particulars of the food given to the fowls at Burnley are mentioned later, and it should not be difficult for owners to adopt these rations. The crates used for sending the birds to Burnley should be large and roomy, so that the inmates may not be too closely packed. A heavy feed should not be given to the birds immediately before putting them into the crate. A few handfuls of grain may be placed in the litter which, for preference, should consist of coarsely-cut chaff, as it is easy for the birds to scratch in such material for the grain. The address should be affixed on the top of the crate, and the owner's name also indicated. Notification should be given to the authorities at Burnley of the dates crates are being sent from the consigning stations.

Conclusion.

Every credit is due to Mr. Macauley for the way in which he performed the arduous duties in looking after the various competing birds, and there is no doubt that the increased egg-production at the competitions was, to a large extent, due to his untiring efforts during the whole period of the tests.

CONCLUSION OF TEST.

LIGHT BREEDS—WET MASH.

Groups of 6 Birds.

Owner.	Breed.	From April 15th.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feby.	To Mar. 14th.	Total.	Position in Competition.
G. McDonnell	White Leghorns ..	44	126	126	126	139	138	147	146	130	133	108	42	1,405	1
S. Buscumb	,, ,, ..	55	118	89	84	129	140	156	150	149	148	130	51	1,399	2
W. M. Bayles..	,, ,, ..	28	111	83	106	139	145	153	148	151	143	127	59	1,393	3
J. H. Treloar	,, ,, ..	22	93	109	110	132	140	147	129	142	127	119	58	1,328	4
F. W. Brine	,, ,, ..	8	85	119	119	135	138	156	145	125	139	110	43	1,322	5
J. Lawson	,, ,, ..	61	122	62	44	125	130	153	149	145	156	122	45	1,314	6
H. T. Mason	,, ,, ..	50	110	67	111	124	133	143	130	136	126	95	43	1,268	7
G. Pocknall	,, ,, ..	55	127	123	109	116	123	143	106	125	101	92	40	1,260	8
Thos. Shaw	,, ,, ..	50	99	83	67	110	136	142	129	130	138	110	51	1,245	9
R. Lecher	,, ,, ..	39	104	86	84	125	132	141	133	127	127	99	48	1,245	
C. H. Busst	,, ,, ..	29	111	104	122	128	136	141	126	108	99	85	30	1,219	11
Manapouri Poultry Farm ..	,, ,, ..	29	99	83	65	108	129	146	131	133	130	110	53	1,216	12
W. G. Swift	,, ,, ..	..	58	82	104	112	133	145	133	133	135	113	41	1,189	13
A. Brundrett	,, ,, ..	8	80	99	102	114	136	155	133	115	110	89	46	1,187	14
N. B. Bruford (Miss)	,, ,, ..	58	120	126	127	128	105	119	104	114	83	67	24	1,175	15
R. W. McIntyre	,, ,, ..	49	117	90	51	67	133	154	147	113	113	93	45	1,172	16
E. A. Lawson	,, ,, ..	41	64	76	97	119	125	113	130	119	133	99	52	1,168	17
P. McPherson	,, ,, ..	28	48	65	93	120	134	142	128	133	133	97	43	1,164	18
Benwerren Egg Farm	,, ,, ..	34	70	76	102	131	130	132	124	132	114	90	26	1,161	19
A. C. Yallop (Mrs.)	,, ,, ..	25	107	111	111	93	130	142	113	129	110	69	19	1,159	20
Fox, A. F.	,, ,, ..	42	92	70	67	110	134	143	123	132	145	90	10	1,158	21
Hook, G. O.	,, ,, ..	35	95	85	97	93	111	134	129	122	120	104	32	1,157	22
Newport Hill Poultry Farm ..	,, ,, ..	69	109	53	88	116	118	126	119	119	117	85	27	1,146	23
J. Wear	,, ,, ..	16	40	72	104	115	130	140	142	133	111	90	31	1,124	24
A. S. Hyndman	,, ,, ..	51	110	89	70	123	130	136	111	115	84	64	23	1,106	25
D. H. Manning (Mrs.) ..	,, ,, ..	28	90	97	99	120	142	123	83	102	105	82	31	1,102	26
W. H. Clingin	,, ,, ..	46	85	58	97	96	120	128	105	117	113	86	45	1,096	27
E. W. Hippe	,, ,, ..	38	72	44	54	115	118	140	131	132	118	97	30	1,089	28
C. A. Wilson	,, ,, ..	46	114	92	72	110	124	137	107	109	107	45	13	1,076	29
J. H. Duncan	,, ,, ..	26	79	98	81	98	125	125	105	100	120	77	32	1,066	30
Excelsior Poultry Farm ..	,, ,, ..	18	114	84	76	105	111	111	103	112	96	85	35	1,050	31
C. E. Cale	,, ,, ..	1	26	62	103	108	122	128	121	132	112	95	38	1,048	32
H. Stevenson (Mrs.)	,, ,, ..	29	73	92	69	92	132	118	116	113	102	74	8	1,018	33
W. White	,, ,, ..	29	73	57	42	84	133	127	126	123	115	95	42	1,046	34
E. Ross	,, ,, ..	43	80	98	110	131	135	125	97	68	73	57	20	1,037	35
J. R. D. Jackson	,, ,, ..	36	108	86	85	106	115	135	111	105	78	47	18	1,030	36
J. E. Moorey	,, ,, ..	40	94	82	76	104	121	122	102	90	89	76	33	1,029	37
O'Donovon (Mrs.)	,, ,, ..	32	81	56	85	109	106	134	110	95	110	77	34	1,029	

Light Breeds—Wet Mash—*continued.*

Owner.	Breed.	From April 15th.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feby.	To Mar. 14th.	Total.	Position in Competition.
W. McDonald	White Leghorns ..	30	56	51	59	97	123	142	108	126	119	69	50	1 010	39
D. Yates	,, ,, ..	50	79	67	67	99	114	120	119	93	78	71	39	996	40
W. H. Brown	,, ,, ..	41	79	50	77	105	108	126	89	113	83	81	40	992	41
S. Cheatle	Brown Leghorns ..	18	58	73	91	100	106	114	101	101	107	74	28	971	42
J. C. Mickleburough	White Leghorns ..	24	46	66	60	102	115	119	107	106	102	82	30	959	43
J. J. West	,, ,, ..	9	32	37	26	98	108	116	111	112	107	91	36	883	44
		1,510	3,854	3,578	3.789	4,930	5,547	5,939	5,310	5,259	5,009	3,918	1,564	50,207	

LIGHT BREEDS—DRY MASH.

Groups of 6 Birds.

Owner.	Breed.	From April 15th.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feby.	To Mar. 14th.	Total.	Position in Competition.
W. H. Robbins	White Leghorns ..	27	116	131	141	143	135	157	145	128	119	98	37	1,377	1
John Walker	,, ,, ..	41	98	53	90	143	155	165	138	139	144	115	43	1,324	2
W. M. Bayles	,, ,, ..	8	62	45	128	136	152	162	156	160	160	106	38	1,313	3
A. Greenhalgh	,, ,, ..	51	125	84	70	115	140	146	136	113	131	119	58	1,288	4
J. R. D. Jackson	,, ,, ..	50	91	98	119	151	153	153	131	101	120	88	22	1,277	5
Thirkell and Smith	,, ,, ..	25	34	94	120	127	138	156	150	141	126	104	48	1,263	6
A. Entieknap	,, ,, ..	19	107	73	65	140	137	132	136	132	154	110	46	1,251	7
A. Siede and Sons	,, ,, ..	46	116	57	83	121	128	149	135	132	142	101	39	1,249	8
Shepherd (Mrs.)	,, ,, ..	38	130	90	114	135	136	121	127	120	109	82	29	1,231	9
W. N. O'Mullane	,, ,, ..	20	142	99	62	126	138	149	137	119	116	56	39	1,203	10
Corinella Poultry Farm ..	,, ,, ..	19	115	78	119	128	137	133	118	121	115	76	19	1,178	11
J. W. Wharton	,, ,, ..	55	77	71	96	108	140	150	117	127	120	80	29	1,170	12
A. O. Hughes (Mrs.)	,, ,, ..	9	3	74	138	121	141	164	150	130	111	87	27	1,155	13
W. Thom	,, ,, ..	70	86	78	78	73	142	138	120	116	112	81	27	1,121	14
H. Hunt	,, ,, ..	..	32	57	89	130	134	145	143	115	125	100	36	1,106	15
E. A. Lawson	,, ,, ..	53	77	62	82	89	143	153	128	114	112	62	30	1,105	16
M. Coad (Mrs.)	,, ,, ..	42	23	45	120	144	122	133	115	96	86	81	43	1,050	17
T. A. Pettigrove	,, ,, ..	36	92	82	85	132	113	123	113	92	90	64	22	1,044	18
H. J. Brown	,, ,, ..	30	78	57	55	99	88	121	116	118	118	84	38	1,002	19
D. A. McNabb	,, ,, ..	4	62	45	66	98	109	138	104	128	109	102	35	1,000	20
W. D. Simpson	,, ,, ..	..	40	32	51	117	127	133	136	120	128	91	21	996	21
Blackburn Poultry Farm ..	,, ,, ..	19	22	34	82	114	132	133	109	113	117	79	26	980	22
J. G. Nicholls	,, ,, ..	11	7	62	100	92	55	120	114	109	118	81	34	903	23
R. J. Thompson	,, ,, ..	7	..	..	34	95	100	102	116	121	129	71	28	803	24
		680	1,735	1,601	2,187	2,887	3,095	3,376	3,090	2,905	2,911	2,118	814	27,389	

HEAVY BREEDS—WET MASH.

GROUPS OF 6 BIRDS.

Owner.	Breed.	From April 15th.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feby.	To Mar. 14th.	Total.	Position in Competition.
A. L. Bull	Black Orpingtons ..	19	132	119	115	144	151	127	113	121	102	87	44	1,274	1
McKinnon Utility Poultry Farm	" " ..	20	118	138	139	123	141	137	113	84	72	71	48	1,204	2
Oaklands Poultry Farm ..	" " ..	48	126	138	130	150	143	131	100	95	68	50	22	1,201	3
T. W. Pearce (Mrs.)	" " ..	39	101	90	119	143	131	122	122	91	98	82	42	1,180	4
A. Greenhalgh	" " ..	30	98	71	115	127	132	129	114	103	90	90	42	1,141	5
Bennett and Chapman ..	" " ..	11	56	101	141	121	118	119	108	104	95	81	59	1,114	6
Wood View Poultry Farm ..	" " ..	56	80	42	101	145	127	101	94	119	104	84	40	1,093	7
A. D. McLean	" " ..	40	86	98	101	117	131	124	107	108	79	59	22	1,072	8
E. T. V. Ellis	" " ..	49	98	62	108	129	137	108	93	98	79	71	38	1,070	9
J. McAllan	" " ..	14	82	93	82	123	129	92	92	96	97	81	37	1,018	10
C. G. Viney	" " ..	67	114	49	118	118	101	112	90	65	93	58	31	1,016	11
E. J. Whelan	" " ..	55	103	100	70	100	126	93	93	90	76	58	45	1,009	12
Excelsior Poultry Farm ..	" " ..	23	93	72	81	111	136	124	100	80	70	67	34	991	13
E. A. McBrown	" " ..	31	57	77	85	116	117	109	105	98	78	78	28	979	14
E. W. Hippe	Rhode Island Reds ..	12	42	60	80	138	110	122	103	71	79	57	13	917	15
Marville Poultry Farm ..	Black Orpingtons ..	27	100	120	98	132	106	79	61	55	44	35	21	878	16
L. W. Parker	" " ..	..	13	58	125	129	139	108	82	64	72	44	27	861	17
Reliable Poultry Farm ..	" " ..	..	15	70	114	131	106	79	67	70	53	67	24	796	18
H. S. Wood	" " ..	56	87	89	80	98	69	82	59	63	30	47	26	786	19
J. E. Moorey	Silver Wyandottes ..	..	40	60	98	78	97	89	68	76	71	46	17	740	20
		597	1,641	1,707	2,100	2,473	2,477	2,187	1,884	1,751	1,550	1,313	660	20,340	

HEAVY BREEDS—DRY MASH.

GROUPS OF 6 BIRDS.

Owner.	Breed.	From April 15th.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feby.	To Mar. 14th.	Total.	Position in Competition.
A. D. McLean	Black Orpingtons ..	26	78	56	98	141	141	114	100	110	104	86	51	1,105	1
T. W. Pearce (Mrs.)	" " ..	9	75	104	113	132	104	114	101	107	107	98	36	1,100	2
W. M. Bayles	" " ..	1	46	76	117	130	121	121	85	112	99	79	43	1,030	3
Oaklands Poultry Farm ..	" " ..	29	95	71	100	146	97	131	85	105	50	71	18	998	4
J. McAllan	" " ..	20	93	86	127	134	64	114	91	65	86	49	43	972	5
E. A. McIntosh Brown ..	" " ..	26	45	38	107	95	101	94	85	92	87	55	31	856	6
D. Fisher	" " ..	..	30	59	99	113	106	89	74	111	33	70	33	817	7
G. R. Bald (Mrs.)	White Plymouth Rocks	4	6	28	50	109	127	109	96	69	26	51	6	681	8
		115	468	518	811	1,000	861	886	717	771	592	559	261	7,559	

LEGHORNS—WET MASH.

INDIVIDUAL BIRDS.

Owner.	Breed.	From April 15th.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feby.	To Mar. 14th.	Total.	Position in Competition.
Rogen and Andrew	White Leghorn	10	29	26	26	26	26	31	29	30	31	26	10	300*	1
R. Berry	,, ,,	9	27	23	24	24	25	27	25	24	29	23	11	271	2
E. A. McIntosh Brown	,, ,,	6	27	20	22	25	24	27	27	26	27	23	12	266	3
Montuna Poultry Farm	,, ,,	8	24	25	21	22	25	25	23	23	25	21	11	253	4
W. H. Robbins	,, ,,	9	21	23	22	23	23	26	24	26	25	22	8	252	5
Brooklyn Poultry Farm	,, ,,	9	26	24	20	23	25	24	24	23	23	19	11	251	6
R. Higgins	,, ,,	8	23	24	20	21	25	28	16	23	26	24	12	250	7
W. H. Thomas	,, ,,	8	25	22	21	21	24	25	26	22	22	22	10	248	8
A. J. Yarrow	,, ,,	5	19	22	15	20	27	27	27	25	28	21	11	247	9
H. Hanbury	,, ,,	7	26	23	23	24	24	24	20	22	22	18	10	243	10
Excelsior Poultry Farm	,, ,,	7	25	21	21	21	22	25	23	24	23	21	8	241	11
H. Hanbury	,, ,,	7	26	22	21	22	21	24	22	24	24	19	9	241	11
J. B. McArthur	,, ,,	7	15	14	22	23	23	26	28	21	26	22	11	238	13
G. W. Robbins	,, ,,	3	22	22	23	24	27	24	21	23	26	12	7	234	14
W. H. Thomas	,, ,,	8	23	22	20	25	25	21	21	21	18	16	8	228	
Marville Poultry Farm	,, ,,	3	21	16	20	20	23	24	26	27	21	19	8	228	15
W. H. Robbins	,, ,,	..	23	22	19	22	24	26	25	24	20	16	7	228	
M. Hunter	,, ,,	9	23	22	19	22	26	29	22	20	15	12	7	226	
J. Schwabb	,, ,,	6	26	17	7	12	24	30	28	25	17	22	12	226	18
Reliable Poultry Farm	,, ,,	6	21	20	18	20	21	23	23	23	22	20	9	226	
Reliable Poultry Farm	,, ,,	4	21	21	18	19	22	24	23	22	24	19	8	225	21
Rogen and Andrew	,, ,,	8	21	22	15	20	22	24	24	20	21	19	8	224	22
Len Smith	,, ,,	3	19	20	17	21	23	25	24	23	20	19	8	222	23
T. Bloomfield	,, ,,	3	1	8	19	23	27	28	28	27	27	20	11	222	
Brooklyn Poultry Farm	,, ,,	..	2	22	18	24	25	26	26	24	24	21	9	221	25
J. B. McArthur	,, ,,	8	13	10	20	21	24	26	23	25	23	17	9	219	26
Excelsior Poultry Farm	,, ,,	3	19	20	20	23	20	22	23	23	22	16	8	219	
R. Berry	,, ,,	7	21	17	10	20	23	24	23	18	24	20	10	217	28
Thos. Shaw	,, ,,	5	27	23	21	20	22	21	21	18	17	13	6	214	29
A. J. Yarrow	,, ,,	8	23	17	3	20	24	24	21	25	22	21	5	213	30
Marville Poultry Farm	,, ,,	2	..	11	20	23	24	25	25	24	27	22	10	213	
R. Higgins	,, ,,	5	20	15	16	20	19	23	24	23	22	17	7	211	32
M. Coad (Mrs.)	,, ,,	7	23	20	18	19	22	22	23	19	19	18	..	210	33
M. Coad (Mrs.)	,, ,,	6	17	15	17	18	23	23	26	19	14	21	10	209	34
Len Smith	,, ,,	1	23	22	21	21	25	22	13	19	14	17	10	208	35
J. Schwabb	,, ,,	8	20	20	20	24	25	26	26	23	11	4	..	207	36
Montuna Poultry Farm	,, ,,	..	19	22	20	24	24	23	13	18	16	18	10	207	
E. A. McIntosh Brown	,, ,,	6	22	24	19	19	23	20	17	16	12	16	10	204	38
A. H. Loomes	,, ,,	7	25	23	22	25	26	20	7	..	13	22	11	201	39
T. Bloomfield	,, ,,	..	17	7	10	22	25	28	27	24	25	14	..	199	40
G. W. Robbins	,, ,,	..	..	15	22	21	23	25	26	25	26	15	..	198	41

* Bird retained until 14th April; eggs laid in twelve months—301.

Leghorns—Wet Mash—*continued.*

Owner.	Breed.	From April 15th.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feby.	To Mar. 14th.	Total.	Position in Competition.
J. Burnside	White Leghorn ..	..	2	17	18	19	22	23	23	21	23	20	8	196	42
E. White	,, ,, ..	8	14	7	11	17	27	26	23	25	22	10	..	190	43
A. S. Hyndman	,, ,, ..	..	25	18	2	15	24	28	25	23	20	8	..	188	44
J. G. Cooke	Brown Leghorn ..	..	3	18	6	17	23	26	23	23	20	17	2	178	45
G. O. Hook	White Leghorn ..	8	25	24	23	25	27	14	9	4	4	8	4	175	46
J. Burnside	,, ,, ..	..	5	20	14	16	21	20	19	14	13	12	5	159	47
M. Hunter	,, ,, ..	4	..	3	16	16	14	14	20	20	21	18	10	156	48
Thomas Shaw	,, ,, ..	9	24	20	20	17	17	7	12	14	4	..	..	144	49
E. White	,, ,, ..	2	8	4	4	4	15	18	19	19	17	15	6	131	50
A. S. Hyndman	,, ,, ..	1	20	22	18	22	20	10	4	1	2	..	..	120	51
G. O. Hook	,, ,, ..	7	26	18	7	19	1	3	12	3	4	5	1	106	52
A. H. Loomes	,, ,, ..	3	..	22	5	22	25	22	1	..	..	..	..	100	53
J. G. Cooke	Brown Leghorn ..	..	..	..	6	16	15	19	19	5	..	..	..	80	54
		268	977	997	920	1,112	1,226	1,247	1,152	1,083	1,043	880	378	11,283	

LEGHORNS—DRY MASH.

Individual Birds.

Owner.	Breed.	From April 15th.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feby.	To Mar. 14th.	Total.	Position in Competition.
Izard and Tierney	White Leghorn ..	9	30	22	24	26	22	22	25	22	20	19	8	249	1
A. Chung	,, ,, ..	8	27	20	19	21	24	25	23	23	24	22	11	247	2
E. A. McIntosh Brown ..	,, ,, ..	2	21	18	20	23	21	27	26	25	25	20	10	238	3
Izard and Tierney	,, ,, ..	7	26	20	25	25	21	25	22	20	21	16	9	237	4
H. Hanbury	,, ,, ..	8	27	23	24	22	17	25	24	22	19	20	4	235	5
McKinnon Utility Poultry Farm	,, ,, ..	9	28	7	15	22	24	28	25	23	23	18	7	229	6
E. A. McIntosh Brown ..	,, ,, ..	1	25	22	21	21	25	24	24	25	17	14	9	228	7
McKinnon Utility Poultry Farm	,, ,, ..	9	23	1	12	27	25	27	25	25	24	17	11	226	8
T. A. Pettigrove	,, ,, ..	8	25	13	21	14	20	23	24	22	24	19	9	222	9
W. M. Bayles	,, ,, ..	9	17	16	8	24	17	26	26	25	24	22	7	221	10
T. A. Pettigrove	,, ,, ..	9	27	23	25	19	23	25	13	14	14	17	11	220	11
G. W. Robbins	,, ,, ..	8	25	25	25	20	21	17	18	15	14	7	6	201	12
E. W. Hippe	,, ,, ..	6	23	20	18	5	18	20	22	21	20	18	8	199	} 13
G. W. Robbins	,, ,, ..	6	15	7	5	24	23	27	24	24	23	19	2	199	}
A. Chung	,, ,, ..	9	27	23	27	24	23	23	22	13	7	..	..	198	15
H. I. Merrick	,, ,, ..	2	..	10	7	25	23	26	24	23	25	20	9	194	16
W. M. Bayles	,, ,, ..	5	21	18	7	15	15	21	24	24	11	19	7	187	} 17
H. I. Merrick	,, ,, ..	4	15	21	19	19	21	22	16	18	18	14	..	187	}
M. Synett	,, ,, ..	8	6	19	19	10	21	21	20	22	21	18	1	186	} 19
M. Synett	,, ,, ..	10	28	21	20	13	22	24	21	11	15	..	1	186	}
D. Adams	,, ,, ..	7	26	22	16	12	10	9	14	14	15	11	2	158	21
H. Hanbury	,, ,, ..	8	19	21	8	12	8	21	13	15	16	10	..	151	22
D. Adams	,, ,, ..	6	19	16	18	10	15	19	11	7	7	1	..	129	23
		158	500	408	403	433	459	527	486	453	427	341	132	4,727	

ALL LIGHT BREEDS OTHER THAN LEGHORNS—WET MASH.

Individual Birds.

Owner.	Breed.	From April 15th.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feby.	To Mar. 14th.	Total.	Position in Competition.
Champion Poultry Farm ..	Minorca	6	26	24	23	25	23	25	23	23	23	20	9	250	1
A. Rushworth	Black Spanish ..	..	14	22	20	21	22	25	25	25	24	16	9	223	2
Rogen and Andrew	Ancona	..	10	18	15	13	23	24	25	15	24	12	8	187	3
A. Rushworth	Black Spanish ..	..	..	3	16	18	21	23	23	22	18	19	10	173	4
Rogen and Andrew	Ancona	..	..	16	9	23	23	19	17	18	19	5	7	156	5
Champion Poultry Farm ..	Minorca	2	6	6	7	16	23	25	22	5	7	10	..	129	6
Rogen and Andrew	Ancona	..	..	5	6	15	18	17	16	16	16	9	6	124	7
K. Quick	Andalusian	..	..	..	3	17	21	23	22	19	17	..	..	122	8
G. Dwyer	Minorca	..	..	..	..	18	19	23	23	20	1	..	..	104	9
G. Dwyer	,, ...	1	2	15	10	8	18	19	14	8	..	..	..	95	10
K. Quick	Andalusian	..	..	..	..	8	22	25	22	14	..	..	..	91	11
		9	58	109	109	182	233	248	232	185	149	91	49	1,654	

ORPINGTONS, ANY COLOUR—WET MASH.

Individual Birds.

Owner.	Breed.	From April 15th.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feby.	To Mar. 14th.	Total.	Position in Competition.
C. E. Graham	Black Orpington ..	10	32	30	29	31	30	29	28	27	26	23	12	307*	1
J. C. Mickleburough	,, ,, ..	6	31	27	26	27	27	29	26	27	26	24	10	286	2
Oaklands Poultry Farm ..	,, ,, ..	2	25	22	28	26	29	26	29	27	24	25	12	275	3
E. K. Archer	,, ,, ..	7	10	24	14	20	30	31	25	29	27	24	11	252	4
R. J. Burroughs	,, ,, ..	7	21	24	14	24	27	27	29	26	24	20	8	251	5
J. C. Mickleburough	,, ,, ..	4	28	26	24	27	24	25	14	28	23	14	11	248	6
J. McAllan	,, ,, ..	..	25	23	24	27	27	24	24	24	22	22	6	248	
S. Buscumb	,, ,, ..	9	34	11	30	16	28	24	24	15	29	14	13	247	8
Marville Poultry Farm ..	,, ,, ..	9	30	24	27	24	23	25	24	22	17	14	8	247	
C. E. Graham	,, ,, ..	10	28	22	23	24	26	28	21	23	18	11	12	246	10
L. Garlick	,, ,, ..	..	5	25	24	24	25	28	26	24	25	22	11	239	11
C. Ludwig	,, ,, ..	9	29	19	18	24	28	22	19	27	20	21	..	236	12
T. W. Pearce (Mrs.)	,, ,, ..	2	30	27	24	28	25	24	15	23	12	15	3	228	13
S. Buscumb	,, ,, ..	5	26	24	23	27	22	22	23	16	17	7	12	224	14
L. Garlick	,, ,, ..	7	24	21	9	17	24	25	23	21	20	19	5	215	15
A. C. Nicholls	,, ,, ..	3	16	24	23	25	12	25	24	20	18	14	6	210	16
A. Siede and Sons	,, ,, ..	..	20	26	16	21	26	20	17	23	22	8	8	207	17
J. G. Pickard	,, ,, ..	..	..	20	24	23	24	26	25	23	23	17	2	207	
A. Siede and Sons	,, ,, ..	7	21	1	27	26	28	21	23	15	15	16	5	205	19
H. S. Wood	,, ,, ..	8	29	15	21	26	22	21	17	17	15	14	..	205	
Marville Poultry Farm ..	,, ,, ..	9	21	19	20	23	17	26	15	19	20	8	7	204	21
R. J. Burroughs	,, ,, ..	1	25	24	18	21	21	17	13	25	15	13	11	204	

* Bird remained till 14th April; eggs laid in twelve months—335.

Orpingtons, Any Colour—Wet Mash—*continued*.

Owner.	Breed.	From April 15th.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feby.	To Mar. 14th.	Total.	Position in Competition.
Oaklands Poultry Farm	Black Orpington ..	6	27	21	15	22	26	25	20	10	16	4	7	199	23
Benwerren Egg Farm	,, ,, ..	3	12	14	28	25	12	26	9	27	14	16	11	197	24
C. C. Dunn	,, ,, ..	9	27	12	22	22	18	18	15	19	12	11	7	192	25
L. W. Parker	,, ,, ..	..	11	28	29	28	28	18	18	13	13	4	..	190	26
L. W. Parker	,, ,, ..	..	1	19	12	26	27	29	27	17	18	13	..	189	27
C. C. Dunn	,, ,, ..	6	26	15	10	20	21	27	8	22	16	16	..	187	28
E. K. Archer	,, ,, ..	8	26	14	22	21	16	17	10	16	15	7	13	185	} 29
D. Fisher	,, ,, ..	..	..	19	26	24	23	26	13	16	13	20	5	185	}
D. Fisher	,, ,, ..	..	9	20	20	22	21	22	20	17	14	13	6	184	31
Benwerren Egg Farm	,, ,, ..	2	24	24	23	23	19	10	16	20	10	9	4	184	31
A. C. Nicholls	,, ,, ..	1	9	4	10	20	24	23	23	21	22	19	7	183	} 33
J. G. Pickard	,, ,, ..	..	14	19	20	20	20	12	23	22	9	14	10	183	}
H. S. Wood	,, ,, ..	9	25	8	18	24	18	24	16	19	13	..	4	178	35
C. Ludwig	,, ,, ..	..	16	6	20	15	28	20	16	17	9	13	..	160	36
H. Weeks	,, ,, ..	..	6	21	18	21	17	22	16	15	9	11	2	158	37
T. W. Pearce (Mrs.)	,, ,, ..	6	4	11	14	17	13	18	22	21	13	12	..	151	38
J. McAllan	,, ,, ..	7	28	20	18	13	20	14	11	3	5	1	..	140	39
		172	775	753	811	894	896	896	767	796	679	548	249	8,236	

ALL HEAVY BREEDS OTHER THAN ORPINGTONS—WET MASH.

Individual Birds.

Owner.	Breed.	From April 15th.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feby.	To Mar. 14th.	Total.	Position in Competition.
W. E. Boyes	Rhode Island Red ..	8	24	20	26	24	23	14	25	23	23	19	5	234	1
A. Bennett	,, ,, ,, ..	9	24	23	23	24	25	26	13	16	27	11	11	232	2
G. R. Bald (Mrs.)	White Plymouth Rocks	..	9	21	22	26	25	27	26	23	22	18	9	228	3
A. Bennett	Rhode Island Red ..	..	11	23	23	23	26	24	23	19	23	15	6	216	4
J. M. Hepburn	Silver Wyandottes ..	2	11	22	23	11	25	16	16	28	23	19	10	206	} 5
W. E. Boyes	Rhode Island Red ..	5	..	21	23	24	25	26	23	21	15	17	6	206	}
W. L. Young	,, ,, ..	9	25	22	19	23	23	19	9	16	20	8	11	204	7
H. L. Trevena	,, ,, ..	8	22	7	..	8	23	26	24	25	24	21	8	196	8
A. Stacey (Miss)	,, ,, ..	..	9	17	12	16	19	24	24	23	12	18	5	179	9
J. M. Hepburn	Silver Wyandotte ..	..	1	25	8	24	16	21	16	25	14	16	..	166	10
J. Mulgrove	Rhode Island Red ..	..	..	98	17	19	15	22	25	25	15	8	8	163	11
R. Irving	Buff Plymouth Rock ..	..	15	20	12	21	24	9	16	15	20	..	9	161	12
Bald, G. R. (Mrs.)	White Plymouth Rock	..	2	19	22	11	24	24	19	15	10	1	6	153	13
J. C. Mickleburough	Silver Wyandotte ..	4	19	4	19	22	15	13	4	19	14	7	3	143	14
W. L. Young	Rhode Island Red ..	8	23	14	18	15	17	18	12	8	7	..	..	140	15
J. C. Mickleburough	Silver Wyandotte ..	2	9	4	5	15	16	21	18	11	16	13	7	137	16
H. L. Trevena	Rhode Island Red ..	..	5	19	19	18	18	17	8	9	8	7	2	130	17
R. Irving	Buff Plymouth Rock ..	..	..	12	10	15	24	24	8	13	16	..	..	122	18
A. Stacey (Miss)	Rhode Island Red ..	5	19	21	18	19	16	2	..	1	3	10	1	115	19
		60	228	323	319	358	399	373	309	335	312	208	107	3,331	

Prize List of Seventh Victorian Egg-laying Competition, 1917-18.

For the greatest total number of eggs laid by a pen in each Class of Sections A and B.

Owner.	Breed.	Total number eggs laid.	Average number per bird.	Market value at 1s. 3d. per doz. £ s. d.
Section A.—Groups of Six Birds.				
Light Breeds.—Wet Mash.				
1. G. McDonnell	White Leghorns ..	1,405	234	7 6 4
2. S. Buscumb	" " ..	1,399	233	7 5 7
3. W. M. Bayles	" " ..	1,393	232	7 5 1
Light Breeds.—Dry Mash.				
1. W. H. Robbins	White Leghorns ..	1,377	229	7 3 4
2. John Walker	" " ..	1,324	221	6 17 11
3. W. M. Bayles	" " ..	1,313	219	6 16 9
Heavy Breeds.—Wet Mash.				
1. A. L. Bull	Black Orpingtons ..	1,274	212	6 12 8
2. McKinnon Utility Poultry Farm	" " ..	1,204	201	6 5 5
3. Oaklands Poultry Farm ..	" " ..	1,201	200	6 5 1
Heavy Breeds.—Dry Mash.				
1. A. D. McLean	Black Orpingtons ..	1,105	184	5 15 1
2. Mrs. T. W. Pearce ..	" " ..	1,100*	183	5 14 7
3. W. M. Bayles	" " ..	1,030	172	5 7 3
Section B.—Individual Birds.				
Leghorns—Wet Mash.				
1. Rogen and Andrew ..	.. .. ..	300†	..	1 11 3
2. R. Berry	.. .. ..	271	..	1 8 3
3. E. A. McIntosh Brown ..	.. .. ..	266	..	1 7 8
Leghorns.—Dry Mash.				
1. Izard and Tierney ..	.. .. ..	249	..	1 6 0
2. A. Chung	.. .. ..	247	..	1 5 9
3. E. A. McIntosh Brown ..	.. .. ..	238	..	1 4 9
All Light Breeds other than Leghorns.—Wet Mash.				
1. Champion Poultry Farm ..	Minorca	250	..	1 6 0
2. A. Rushworth	Black Spanish ..	223	..	1 3 2
3. Rogen and Andrew ..	Ancona	187	..	0 19 5
Orpingtons, any colour.—Wet Mash.				
1. C. E. Graham	Black Orpingtons ..	307‡	..	1 11 8
2. J. C. Mickelburough ..	" ..	286	..	1 9 9
3. Oaklands Poultry Farm ..	" ..	275	..	1 8 8
All Heavy Breeds other than Orpingtons.—Wet Mash.				
1. W. E. Boyes	Rhode Island Red..	234	..	1 4 4
2. A. Bennett	" " ..	232	..	1 4 2
3. Mrs. G. R. Bald	White Plymouth Rock	228	..	1 3 9

* Five birds only.
† Bird retained till 14th April, 1918. Total number of eggs laid, 301.
‡ Bird retained till 14th April, 1918. Total number of eggs laid, 335.

For the greatest number of eggs laid by pens of Light and Heavy Breeds during the first four months of the Competition, *i.e.*, from 15th April to 14th August, 1917 (Winter test).

Owner.	Breed.	Total number eggs laid.	Average number per bird.	Market value at 1s. 6d. per doz.
				£ s. d.
Section A.—Groups of Six Birds.				
Light Breeds.				
1. Miss N. B. Bruford ..	White Leghorns ..	489	81	2 10 11
2. G. McDonnell	,, ,, ..	483	80	2 10 3
Section B.—Individual Birds.				
Light Breeds.				
1. Rogen and Andrew ..	White Leghorns ..	103	..	0 10 9
2. A. Chung	,, ,, ..	98	..	0 10 2
Section A.—Groups of Six Birds.				
Heavy Breeds.				
1. Oaklands Poultry Farm ..	Black Orpingtons ..	511	85	2 13 3
2. McKinnon Utility Poultry Farm	,, ,, ..	470	78	2 8 11
Section B.—Individual Birds.				
Heavy Breeds.				
1. C. E. Graham	Black Orpingtons ..	115	..	0 11 11
2. Morville Poultry Farm ..	,, ,, ..	102	..	0 10 7

For the pen which shows the greatest average weight per dozen eggs laid during the whole period of the competition.

Section A.—Group of Six Birds.			
1. Bennett and Chapman ..	Black Orpingtons ..	1,114	(Average weight, 25¾ ounces approximately per dozen)
Section B.—Individual Birds.			
1. C. E. Graham	Black Orpingtons ..	307*	(Average weight, 26½ ounces approximately per dozen)

For the pen the eggs from which realized the highest market value throughout the competition.

Section A.—Group of Six Birds.				
1. G. McDonnell	White Leghorns ..	1,405	234	7 6 3 at 1/3 per doz.
Section B.—Individual Birds.				
1. C. E. Graham	Black Orpingtons ..	307*	..	1 11 11 at 1/3 per doz.

* This bird was retained till 14th April, 1918. Total number of eggs laid, 335.

AMERICAN AGRICULTURE.

Report to the Director of Agriculture on Agricultural Education Methods and Agricultural Research Work in the State of California, by A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent.

(Continued from page 275.)

COUNTY FARM BUREAUX.

Farmers' institutes are not held in counties where there is a farm adviser. Here the meetings of the County Farm Bureaux take their place.

The farm adviser county agent movement is one of the most recent developments of American extension work. Judging from the brief experience I have had of it, and from what I have observed in farming districts, I should say that it is one of the most promising agricultural movements of the time, and is destined to play a big part in developing better systems of farming throughout the country. The Federal Government now works in co-operation with the States, and provides half the money required to pay the salaries of the farm advisers. In California, the practice of appointing farm advisers is rather different from that of the States. California requires that one-fifth of the farmers of a county must join an organization known as the Farm Bureau before a county adviser will be assigned to that county.

The farmers must request that a farm adviser be stationed in the county, and the Board of Supervisors (or the Local Government Board) must make an appropriation of $2,000 per year to cover the office and travelling expenses of the farm adviser. When these preliminaries are arranged, the University appoints the adviser, and the Federal Government and the University pays the adviser's salary, which usually ranges from $1,500 to $2,000 per annum, and provides a motor car for travelling.

In each county the people who join the Farm Bureau are divided into ten or twelve groups, called Farm Bureau Centres. Each of these centres receives a visit from the farm adviser once a month. The local groups of farmers elect a chairman, who acts as director for that centre.

The farm adviser responds to any individual calls for consultation, help, or advice, the desire for which may have arisen during the month, and of which the director of that particular centre has been notified.

In the evening, the farm adviser holds a meeting. Thus there are each month ten meetings in each county having a farm adviser, where previously, under the system of farmers' institutes, one or two meetings were held during the year.

The directors of each farm centre meet once a month at the farm adviser's office, to transact business and shape a policy for the Farm Bureau. These meetings usually last two hours. Each farmer who is a member of the Farm Bureau pays $1 per annum toward the organization.

I inspected the work of farm advisers in three counties—Keren, Los Angeles, and San Joaquin.

There is no doubt that the organization is doing splendid work.

I may remark that G. C. Kreutzer, formerly of the Water Commission, Victoria, is farm adviser in Kern County, Bakersfield.

I visited him at his office at Bakersfield. He informed me that Kern County had thirteen Farm Bureaux, and over 600 members, each of whom paid a dollar for organization work. He had an assistant—a young graduate of Berkeley—fine office and equipment, and two motor cars.

He appeared to be doing very good work in the county, and the membership and number of meetings was rapidly increasing.

The function of the farm advisers is to act as clearing houses for information for farmers of the county. They bring the information of the Agricultural College, the Experiment Station, and the Department of Agriculture to the farmer needing it.

The adviser is in all cases a scientifically trained man—one who has graduated from an agricultural course at the University, and who has had practical experience of agriculture to supplement his scientific trainings. He spends his whole time in the county, having his offices and head-quarters at the county seat.

His work is, broadly:—

(1) To advise on soil treatment, fertilization, crop adaptation and culture, animal husbandry.

To answer any questions and give any advice to those who apply for information.

(2) Organization work for the farmers of the community, *e.g.*, giving assistance to boys' clubs, farmers' organizations, marketing and buying organizations. Kreutzer, for example, in Kern County, organized a series of stock sales for the sale of hogs, calves, and sheep. It appears that, in California, there are no regular stock sales such as we have in Australia in country centres and in the metropolis. The packers and butchers merely visit farms and settle what prices they will pay. In Kern County a series of stock sales were organized on what the farmers called "the Australian system," and these sales attracted large attendances of buyers.

(3) Investigation of the larger problems of farm management in the county.

(4) Demonstration of these principles and practices through the co-operation of the interested farmers.

The salary of the farm advisers is usually $1,500 to $1,800. In California there are 58 counties, and 29 of these have farm advisers. These 29 counties have three-quarters of all the farms of the State.

No farm adviser is stationed in any county in California unless the county carries out the following:—

(1) Enlists 20 per cent. of the farmers of the county as members of the Farm Bureau, and secures $1 from each for organization work.

(2) The Board of Supervisors of the county must appropriate $2,000 per annum for expenses of the county agent.

In each county usually twelve farm bureaux are organized, and these hold meetings once a month. County-wide campaigns for county betterment along definite agricultural lines are often projected by the farm

adviser, and organized through committees from the Board of Directors and from farm bureau centres. For example, "contesting associations," "boys' clubs," "squirrel extermination," "increased food production," "food conservation," "drainage control," "electric power extension," "pure seed campaigns," and many other projects have been undertaken by farm advisers working through the farm bureau centres.

It may be remarked that no county is ever approached to introduce the farm adviser's system. The initiative and organization must arise in the county.

The farm adviser's work is organized through the county Farm Bureau. The adviser travels through the county on schedule, calling at each farm centre in turn, where he visits only *those farmers on whom he has been requested to call,* the calls being scheduled in advance by the local farm bureau director.

Over 1,300 counties in the United States now have farm advisers. The movement only started a few years ago, and it is too early to say what the ultimate results will be. Probably ten years must elapse before the full value of the movement can be estimated. There is no question, however, that in California fine results are being achieved. For example, in 1917, in nineteen counties in California, 8,177 farmers were visited on their farms, 22,864 calls were made by farmers at the farm adviser's office, 2,529 meetings were held under the auspices of county farm bureaux, 5,049 meetings were attended by the farm advisers, and the total attendance registered was 103,792.

Large increases in areas for crops have been registered in counties where farm advisers have been stationed, and much progressive work with live stock and orchards have been registered.

BOYS' SCHOOL CLUBS.

These have done excellent work in California. Each farm adviser has general control of all extension activities in his county. One thousand nine hundred and twenty boys in California were organized in high schools and elementary schools last year. The work was only begun two years ago, but it is anticipated that the number of boys taking part in club work will rapidly increase.

The work in the clubs relates to raising crops and animals for competition purposes. The crops usually selected are potatoes, grain, sorghum, beans, vegetables, and sugar beets. Wheat is not used for crop competitions. The animals usually used for club work are pigs and poultry.

Graduates of Berkeley are usually chosen as club leaders, but in many cases teachers of high schools are selected for the task.

In the latter case, the University pays the teacher a sum to cover travelling expenses and provide a small bonus.

Dean Hunt says he does not believe in volunteer work; he believes in payment for all services rendered by the teachers.

The clubs are the means by which the boys make money in farming by the practice of it.

The usual sizes of the plots are:—Potatoes, $\frac{1}{4}$ acre; grain sorghum, 1 acre; corn, 1 acre; beans (Tepary, Mexican red, or Pink), $\frac{1}{4}$ acre; vegetables, $\frac{1}{4}$ acre.

These boys' clubs have reached a very high pitch of development in Utah, where, I understand, in a total population of some 400,000 people, there are not less than 15,000 boys engaged in farming crops and raising stock. The Pig Clubs are usually worked as follows:—The boys select two pigs, eight to ten weeks old, and keep them four months. They are then six months old, and should weigh between 175 and 200 lbs. They keep records every day of the total quantities of feed used. This feed is valued at cost. The total time and feed costs are carefully checked out, and the profit on raising the pigs after charging all expenses is determined. The boy then writes an essay on "How I raised my pigs." It may be mentioned that the banks will lend money at 6 per cent. to any boy in a pig club for purchase of pigs on the boy's note of hand.

After the boys' high school clubs were organized there was a movement established to bring the clubs to the intermediate schools, and the University was asked to lend itself to the organization of such clubs.

Experience in high school clubs has shown, however, that the success of boys' clubs of any sort depended on supervision. It is essential to the success of the club that the work of each individual be inspected at least once a month during the progress of the work.

It was obviously impossible for the college directly to undertake so stupendous a task with its present resources, and it was unwilling to make the attempt under conditions which spelled failure. Hence it proposed to Boards of Education and to principals of high schools that it would lay out plans for the conduct of boys' agricultural clubs in the public schools, and help the school authorities to organize them, if they would assume the entire responsibility for their supervision.

Already in Napa County the High School, through its teacher of agriculture, C. L. Hampton, has started the movement of boys' agricultural clubs. Six such clubs were conducted in Napa County during the past year, and the prize winner of each attended the third annual convention of the Boys' High School Agricultural Clubs, held at Davis in October.

In the past, high school teachers of agriculture have been itinerant in character, going from school to school from year to year, remaining but nine or ten months in any one community. It is highly desirable for the future development of California country life that these men should become established parts of the community in which they are placed. They should spend the entire calendar year, with a vacation at Christmas, in farming activities of benefit to their own people.

In order to demonstrate the feasibility of this plan, the College of Agriculture, through the Agricultural Extension Division, has proposed to the high schools and to the Boards of Education that they should employ these teachers for twelve months in the year, and furnish them with adequate transportation in order to reach their work out on the farms. If at least three months is spent in agricultural extension activities, and if these activities are under the direction and supervision of the University of California $200 per year will be contributed by the United States Department of Agriculture, and by the University of California, to the salary of each of the agricultural instructors.

Already ten Boards of Education have officially entered into such an agreement. Briefly, the agreement is this: That the teacher of

agriculture agrees to spend three months in agricultural extension activities. The Board of Education agrees to spend $200 for his expenses, while the United States Department of Agriculture and the University of California agree to add $200 to his salary and supervise his work.

EXPENDITURE OF DEPARTMENT OF AGRICULTURE, UNIVERSITY OF CALIFORNIA.

The total expenditure for 1917-18 was $605,188, and the estimated expenditure for 1918-19, $638,584. The detailed results are summarized in Table I. hereunder:—

It will be seen that of the $638,000 to be expended in 1918, $470,000 represents State appropriations, and the balance Federal Fund.

No fees are received from students, as instruction is free. A student, however, must be a graduate of a high school to enter the University.

TABLE I.

BUDGET FOR SALARIES, MAINTENANCE, AND EQUIPMENT OF THE DEPARTMENT OF AGRICULTURE, UNIVERSITY OF CALIFORNIA, FOR THE BIENNIUM ENDING 30TH JUNE, 1919, SHOWING THE DISTRIBUTION OF FUNDS.

—	1917-18.	1918-19.	1917-19.
State Appropriation	$430,000	$445,000	$875,000
General Agriculture	$40,000	$40,000	$80,000
Hatch Fund	$15,000	$15,000	$30,000
Adams Fund	$15,000	$15,000	$30,000
Morrill Fund	$27,500	$27,500	$55,000
State Appropriation Insecticide and Fungicide Control	$5,000	$5,000	$10,000
Carnegie Income	$3,820	$3,820	$7,640
Federal Smith-Lever Fund	$39,434	$48,632	$88,066
State Smith-Lever Fund	$29,434	$38,632	$68,066
Total	$605,188	$638,584	$1,243,772

Table II. shows the appropriation for each department of the College of Agriculture. It will be noticed that, in the appropriation for 1917-18, the expenditure on the ten leading divisions in the College are:—

1. Agricultural extension work	$81,000
2. University farm	73,000
3. Citrus Experiment Station	72,000
4. Director's office	40,000
5. Animal husbandry	33,000
6. Agronomy	26,000
7. Pomology	25,000
8. Entomology	23,000
9. Forestry	23,000
10. Agricultural education	19,000
Total	$415,000

TABLE II.

APPROPRIATION FOR SALARIES, MAINTENANCE, AND EQUIPMENT, DEPARTMENT OF AGRICULTURE, UNIVERSITY OF CALIFORNIA.

—	1916–17.	Salary Increase, 1917–18.	1917–18.
Agricultural Chemistry	$7,700.00	$1,000.00	$9,000.00
Agricultural Education	$18,720.00	$200.00	$19,000.00
Agricultural Engineering	$11,000.00	$1,625.00	$13,000.00
Agricultural Extension	$64,792.00	$7,010.70	$81,000.00
Agronomy	$24,760.00	Decrease	$26,000.00
Animal Husbandry	$32,110.00	$400.00	$33,000.00
Botany	$1,080.00	..	$1,080.00
Citriculture	$6,920.00	$1,400.00	$8,000.00
Citrus Experiment Station	$65,840.00	$1,833.34	$72,000.00
Dairy Industry	$8,500.00	$2,800.00	$11,000.00
Director's Office	$40,548.00	..	$40,242.00
Entomology	$21,040.00	$1,900.00	$23,000.00
Forestry	22,360.00	$200.00	$23,000.00
Genetics	$6,720.00	$100.00	$7,000.00
Horticulture	$2,666.00	..	$2,666.00
Imperial Valley Experimental Farm ..	$9,140.00	$300.00	$8,000.00
Irrigation Investigations	$6,320.00	$800.00	$9,000.00
Landscape Gardening and Flor.	$11,020.00	$200.00	$10,000.00
Library	$3,540.00	..	$5,000.00
Nutrition	$8,340.00	$100.00	$8,200.00
Plant Pathology	$11,400.00	$100.00	$12,000.00
Pomology	$20,630.00	$700.00	$25,000.00
Poultry Husbandry	$8,440.00	$500.00	$10,000.00
Rural Institutions	$7,000.00	..	$7,000.00
Soil Chemistry and Bacteriology	$15,086.00	$400.00	$18,000.00
Soil Technology and Soil Survey	$18,980.00	$600.00	$19,000.00
University Farm Administration	$50,280.00	$500.00	$54,000.00
University Farm School	$17,660.00	$1,120.00	$19,000.00
Veterinary Science	$15,120.00	$1,200.00	$17,000.00
Viticulture	$14,080.00	$700.00	$15,000.00
	$551,792.00	$24,889.04	$605,188.00

STAFF AND EQUIPMENT AND STUDENTS AT BERKELEY.

The expert agricultural staff of Department of Agriculture of the University of California numbers 165.

In general, the staff is provided with five commodious rooms and generous equipment.

The staff is divided into eighteen divisions, as before indicated, each division being in charge of a professor, and each division being provided with separate teaching and research laboratories.

The number of students taking the agricultural course at Berkeley last year was 637. This year there has been a drop to 300, because of the calls made by the first draft for military service.

The total number of students in regular attendance at the University of California in normal times is 7,000.

In addition to the numbers attending the four years' agricultural course at Berkeley, 314 students took the course at Davis, and 250 students were enrolled for short courses, making a total of over 1,000 for 1917.

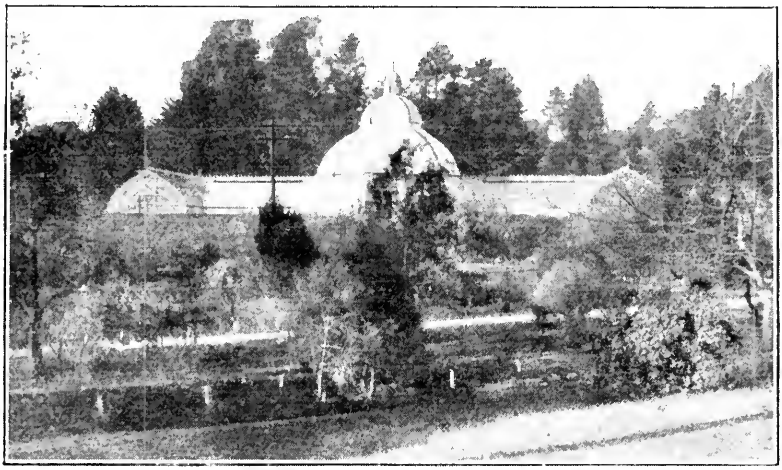
WORK AT THE DAVIS FARM.

The farm is situated 10 miles from Sacramento, the capital of California, and the farm adjoins the railway line and the town of Davis. The area of the farm proper is 779 acres, but 300 acres are rented, making a total area of 1,079 acres. The original cost of the farm was $125 per acre. It was a big grain ranch in 1906.

Youths must be eighteen years of age before entry.

The standard of education of the entrants varies. Some have only a grammar school education. Others are graduates of the high school. The course of training for high school graduates is two years, for others three years. The students live in dormitories on the farm, and are allowed to govern themselves very much on the system of prefects at our public schools.

Under normal conditions, 175 to 200 students live in the dormitories, and a number in the town of Davis.



Greenhouse for Study of Plant Propagation at Berkeley.

The University farm is divided into nine major divisions:—

(1) Agronomy, (2) annual husbandry, (3) agricultural engineering, (4) poultry husbandry, (5) pomology, (6) viticulture, (7) irrigation, (8) dairy industry, (9) citriculture.

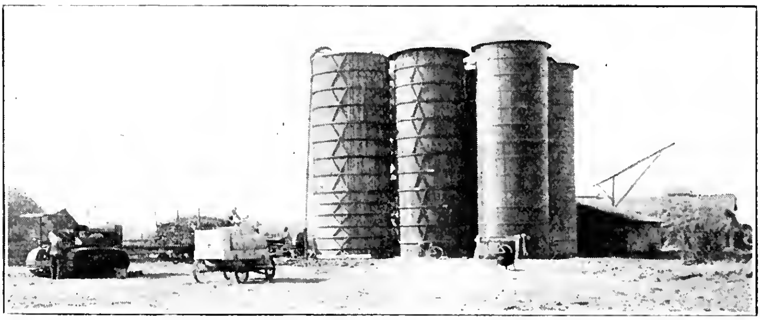
All these divisions carry out experimental and research work. They all have projects on a similar plan to that prescribed for Berkeley, and report to Dean Van Norman, the Director, who in turn passes these reports to Dean Hunt.

I was informed at Davis that the total appropriation was $140,000 per annum. This is higher than the $73,900 given me by Dean Hunt, but the discrepancy may be accounted for by taking the lower figure as maintenance and salaries, and the higher figure as including permanent improvements and buildings, and in addition to salaries. I could not get segregated details of the cost of each division, and especially the cost of running the farm, as Dean Norman, the Director, was out of the State, and his assistant did not have the details.

The main features of interest were:—

1. *The Buildings.*—The administrative block, the cafeteria, the three large dormitories (accommodating 200 students), Shields Hall for the classrooms, form an imposing set of buildings on the main campus. Each of the divisions referred to above has a building replete with laboratories and classrooms for students.

Dairy Industry Division.—The dairy division occupies a two-story block of buildings and a basement equipped as a creamery. The building contains rooms for the staff, a finely equipped dairy laboratory, and numerous classrooms. In the laboratory were five 24-bottle facile centrifuge Babcock testers, two 12-bottle testers, a Farrington moisture test oven (made by the Creamery Package Company, Chicago), and several sets of apparatus for conducting the Hart casein test. The creamery does all the marketing of milk for the town of Davis. The State law requires all milk for human consumption to be pasteurized for 25 minutes at 140° F. Each dairy is compelled by law to have a self-recording thermometer. The thermometer used here is a Foxborough Patent Recorder, made by the Foxborough Company, Massachusetts. The record made by this thermograph showed graphically



Battery of Silos, University Farm, Davis.

the rise of temperature and the number of minutes held at 140° F., and the number of minutes the milk took to cool.

These records are kept for inspection by the State Dairy Bureau.

The plant was treating 180 gallons a day.

The State law further requires that all cream made into butter must be pasteurized unless produced from tuberculin-tested herds.

The cream was being treated by a Wizard pasteurizer in 200-gallon vats (maker, the Creamery Package Company, Chicago). At the time of my visit, they were making sweet cream butter, *i.e.*, the cream was pasteurized and churned immediately afterwards without ripening. Churning was conducted at 56 to 58° F., and buttermilk used by the poultry plant.

Tests were in progress to make an edible cheese from this buttermilk.

A patent steam sterilizer was used for sterilizing cans (maker, A. Jensen and Company, Oakland, California). A patent butter cutter, which cut the butter into perfect cubes of 56 lbs., was in working. The maker of this cutter was A. Simpson, Oakland, California.

The State law further prescribes that all milk must be dated with the day the milk is pasteurized. The milk was being put up in bottles

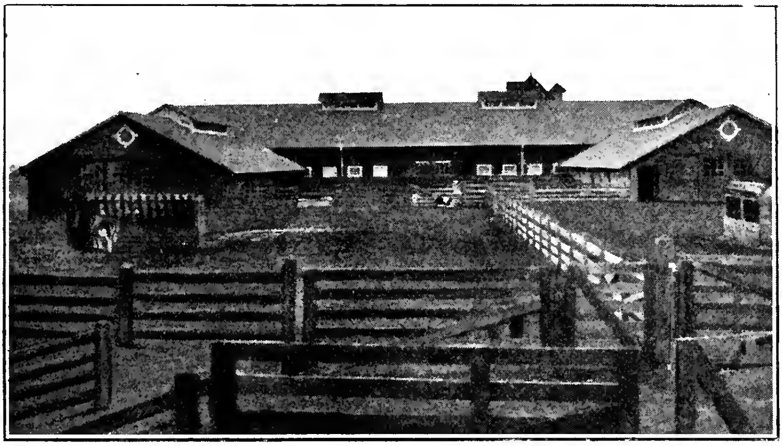
similar to those in use by the Talbot Milk Institute and the Willsmere Company, in Melbourne. Seven different types of separators were in the dairy. Students became familiar with the working of these by assembling and dismantling the machines.

In the cheese room, 200 lbs. of cheese per day was being made. All cheeses are paraffined when six days old by dipping in paraffin at 225° F.

An ice cream plant was in operation. Ice cream seems to be very extensively eaten in the United States, even in the depth of winter. The State law prescribes that all cream used for ice cream must be pasteurized. The plant used was made by the Creamery Package Company. The ice cream took fifteen minutes to freeze, and was then packed in brine at 14° to 16° F.

Three kinds of cheese were being made by students:—Full cream, half skim, full skim.

A large electric oven, capable of holding 432 samples of soil or cheese, was extensively used by the dairy branch.



A view of the Dairy and Beef Barns, Davis Farm.

The course in dairy industry includes four divisions, each requiring two hours' lectures and four hours' laboratory work for one semester (half-year):—

(*a*) Elements of dairying;
(*b*) Dairy practice;
(*c*) Market milk and cheese making;
(*d*) Dairy manufactures.

Annual Husbandry.—This course includes stock judging (1) and (2); breed and types (1) and (2); stock management; foods and feeding (1) and (2).

The head-quarters of the division is a commodious brick building, with rooms for the professional staff, stenographers, clerks, and record keepers of the division of annual husbandry.

The horses were housed in a large horse barn, with ten stalls and four horse boxes on either side of a central alleyway. The overhead loft was used for storing feed. The working horses were regularly fed on 6 lbs. of crushed barley and all the alfalfa hay they would eat. For breed-

ing horses, oats were added to the rations. The horses were almost exclusively Percherons. A grey two-year-old colt had just been purchased for $1,500.

The cow barns were very extensive. Beef cattle were kept in one wing of the barn, and dairy cattle in another, and a feed room connected the two portions.

Records were kept of the amount of feed—alfalfa, hay, silage, roots, grain, brash, beet pulp, &c.—fed to each animal; the body weight, weight of milk, percentage of fat and solids in the milk. The records of milk and butter fat production of the cows were set up in front of the stalls. Two records which appealed to me were:—

Holstein—20,106 lbs. milk, 718 lbs. butter fat.

Jersey—13,165 lbs. milk, 809.7 lbs. butter fat.

The floors were of cement, and the feed bins were open cement structures. They were milking 31 cows, mostly Holsteins and Jerseys. The cows were being fed on moistened beet pulp and alfalfa hay, with a little crushed barley.

The bails were not unlike those of Werribee, except that they had a movable centre piece, which could be adjusted to move 4 inches forward or backward, according to the length of the cow.

The beef cattle section comprised Shorthorns, Herefords, and Aberdeen Angus. They were being fed on corn silage and alfalfa hay. The cattle were certainly fine specimens, and were kept in excellent condition. A long open shed with racks fitted at the back for hay were used for young stock. The cattle also were allowed to eat as much alfalfa hay as they chose.

The hog house was a large building divided into 40 pens, connected by races with hog yards containing portable self-feeders and triangular hog houses.

The breeds kept were Duroc Jersey, Chester White, Berkshire, and Poland China.

The animals on the whole were an exceptionally good lot.

Two hundred and sixty sheep were kept on the place, the principal breed being Shropshire, Hampshire, Romney Marsh, and Rambouillet. The latter appears to have a much bigger frame than the merino, and certainly has as many folds. One ram shore 30¼ lbs. of wool, with 364 days between shearing.

On the afternoon I visited the sheep and hog yards the students were standing around watching the assistant marking the lambs. The students caught the lambs and held them on a block whilst the instructor seared off the tails with a hot iron. All went well till the Persian fat-tailed sheep were marked. The size and thickness of the tails temporarily puzzled the operator and the students, but an extra heating of the iron and a little more fortitude on the part of the operator enabled the operation to be carried out without mishap. Nor did the fat-tailed Persian appear to suffer more discomfiture than the other breeds.

Irrigation Division.—This division deals with the preparation of land for irrigation, the water requirements of field crops and orchard and application of water, the design and construction of farm laterals, and methods and devices for measuring water and drainage problems.

The water requirements of alfalfa under various conditions were being tested by a series of 24 pots 4 feet deep and 23 inches in diameter.

An interesting feature of the division was a collection of all the meters used in measuring water. These are fed from a reservoir, and the students make comparisons of the rate of flow from each meter.

Large numbers of soil samples are taken during the irrigation season to various depths, to determine the depth of penetration of water in various fields and on various crops with different systems of irrigation. These soil samples are taken with special 2-inch soil augers, obtained from the Sacramento Implement Company, Sacramento, California, and the investigations are very helpful in establishing the maximum duty of water with various types of crops.

Pomology.—This division includes horticulture. The work comprises instruction and research. Research work is being conducted on 24 projects, included in the 360 projects outlined above. The experiments comprise pruning, pollination experiments and bud studies, the effect of mulching and various types of cultivation on crop yields—tillage tests, the proper distance apart to plant deciduous trees.

Moreover, small orchards have been planted at all distances apart, from 12 x 12 to 36 x 36, to determine the best distance apart to produce the maximum yield for each type of tree.

Very complete records are taken of the blooming period of every variety of tree. A feature of the horticultural branch is a card index system, with cards for each tree, showing its history and treatment annually since it was planted.

Sixty acres of the farm are devoted to these various tests, and the chief types of trees grown are plum, peach, apricot, prune, almond, and cherry. The apple does not thrive at Davis.

Poultry Division.—At present 25 men were specializing in poultry keeping. This is about half the normal number.

The equipment comprises two lecture rooms, incubator room, storage rooms, candling rooms, two laboratories.

Several thousand birds, mostly white leghorns, were kept for instruction purposes. Three dozen incubators, of ten different makes, each incubator with a capacity of 150 eggs, were used for practice in incubation.

On the whole, the equipment was good, but notably lacking in many of the labour-saving devices to be found on the suburban poultry farms near Melbourne. Trap-nesting was adopted to determine the laying propensities of the best hens. No single pens had been installed for testing the birds.

Agronomy.—This division had the usual complete equipment of lecture rooms, laboratory rooms, and offices. The laboratories were well equipped with specimen crops of all kinds for instructional purposes. The field plots were very numerous, and consisted of variety tests of all types of dry land and irrigated crops.

The cereal tests were very like our own, except that they were very much smaller than those at Werribee, varying from 1/40 to 1/100 of an acre. I was rather astonished to find practically every variety of Australian wheat was being tested side by side with American wheats. These Australian varieties were obtained from the New South Wales Department. Rotation and fertilizer tests were carried out, but I have no hesitation in affirming that our Werribee crops were better planned than the Davis permanent plots. On the other hand, they have at Davis a much larger number of tests with the grasses, legumes, and new crops like grain sorghums, than we have.

Other features of interest were:—

(*a*) The farm machine shed, where, under competent agricultural engineers, all types of farm machinery were taken apart and re-assembled as practice for students.

(*b*) The cafeteria, where the students were their own waiters. They took a large tray, a serviette, fork, spoon, and knife, and walked along a railing containing all types of eatables. They selected what they required, and carried the eatables on the tray to their seats, and paid for the meals on a *la carte* basis.

(*c*) The battery of silos: Six 120-ton silos were erected side by side near the cow barn.

(*d*) The vineyard, comprising 35 acres of vines, with 550 different varieties of grapes.

The stock on the farm at the time of my visit comprised 130 head of dairy cattle, 56 head of beef cattle, 260 sheep, 25 goats, 400 hogs, 12 light horses, and 15 pure-bred Percherons and Shires.

UNIVERSITY FARM, KEARNEY PARK, FRESNO.

This farm consists of 5,400 acres of rich land, bequeathed to the University by a wealthy bachelor named Kearney. The value of the property is estimated at $1,000,000, and it is used to provide revenue for the University. The net profit last year was over $60,000. Portion of the area—2,000 acres— has been rendered unfit for cultivation by the rise of salt and alkali—just as at Cohuna, Victoria.

In the county of Fresno over 200,000 acres of raisins are grown, the majority being the Muscat of Alexandria and Thompson's Seedless. The average production of raisins in Fresno is from 1½ to 2 tons.

Kearney Park is in charge of a very able manager—Mr. Friselli—and I am obliged to him for much valuable information on various aspects of fruit culture in California.

At Kearney Park, 800 acres are planted to vines. Most of these vines are twenty years old. The crowns of the vines are like huge balls, and on the *south side* (the sunny side) the vines get badly burnt with the heat of summer. Mr. Friselli is attempting to rejuvenate these by bringing up suckers from below the ball-like crowns.

Although the rainfall is *only* 8 *inches*, for six years these vines have not been irrigated, owing to the water table being so near the surface. The annual yield of raisins for the past six years was 1,020 tons from 800 acres of vines.

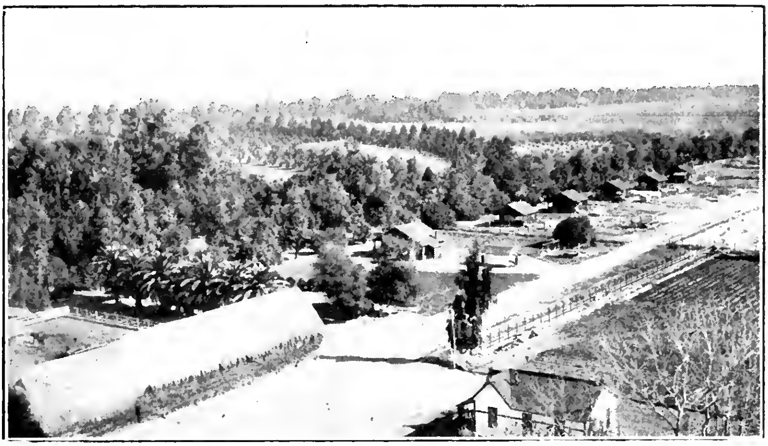
Two mules were hauling a steel waggon on which cuttings made two days before were being burnt as the car moved along the rows. The cost was 1s. 8d. per acre.

The men were pruning at the time of my visit. Forty were engaged on this work, and they received $3 per day. The average grape-picker earned $5.20 per day last year. They receive $3 per long ton—100 trays of 22 lbs. green weight. The Japanese labourers earned $12 a day picking grapes by piece work. The grapes dry in the proportion of 3.4 to 1.

The principal raisin is the Muscat of Alexandria. This is dried in the sun—not dipped in lye—by placing in boxes 2 x 3. The bulk of the raisin crop of the United States is marketed in cartoons. The raisin industry is in the hands of a co-operative raisin company—an association of 85 per cent. of the growers of California.

This association pays a flat rate of $3\frac{1}{2}$ cents. a lb., equal to \$70 a ton, for all raisins delivered. Then the manufacturing, advertising, and selling expenses are deducted, and the grower gets the balance. Last year they got an extra cent per lb., equal to \$90 per ton—£18. This price gives a good return to the grower. Mr. Friselli estimates that the raisins cost him \$35 a ton to produce, so that the average net return is \$55. Vineyards within a radius of 4 to 6 miles of Fresno sell for \$800 per acre.

The Italian-Swiss colony has a machine for grafting phylloxera-resistant vines. I saw one in operation at the United States Plant and Seed Introduction Farm at Chico. It consists of a lever which operates two knives which can be set at any angle. After the wood has been sorted it is just held to the machines, and one knife cuts a section at a slope of, say, 60°. The second knife then comes down and cuts a tongue two-thirds the way along the slope. The wood can be cut and the tongue cut as quickly as a man can pull a lever back and forward. The



Workmen's Cottages in a Park of Eucalypts and Palms at Kearney Farm. (Note Alfalfa Stack thatched with Palm Leaves.)

price is about \$40, but I should think it would save an immense amount of labour in grafting.

The advantage of the grafting machine appears to be that it cuts all similarly sized pieces of wood alike, and makes a uniform cleft in the wood.

Olives and Figs.—Olives are very profitable at Fresno. They require very little water. The best pickling olives return \$175 per ton, and Spanish Queen, an exceptionally good olive, realizes up to \$300 per ton. Olives for oil realize \$45 to \$55 per ton. Oil olives have only one-third the value of the pickling olives. Frozen berries and small berries are used for oil.

The best pickling olives grown at Fresno are the Mission Olive, Spanish Queen, and Manzanillo. They are planted in squares 25 feet apart, then alternate diagonal rows are taken out, leaving the trees $36\frac{1}{2}$ feet apart.

The olive comes into bearing at the fourth year, but the yield is small. The fifth and sixth years they pay for their cultivation. The

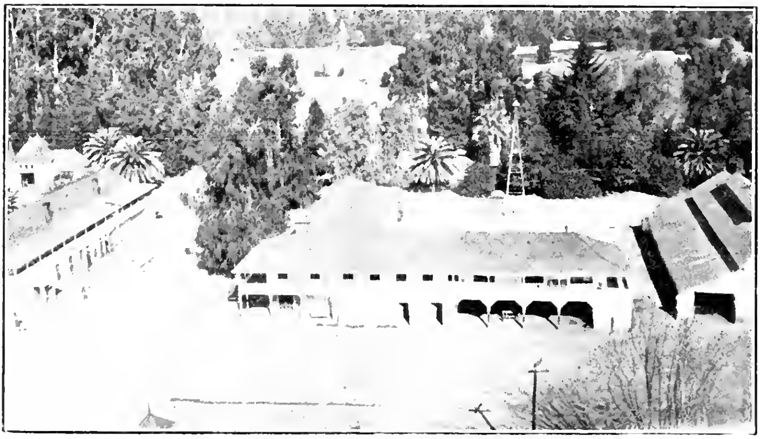
yield afterwards averages $1\frac{1}{2}$ to 2 tons per acre, though 3 tons per acre have been obtained at Fresno. The cost of harvesting the crop is $17.50 to $25 per ton, according to the heaviness of the crop. The crop is harvested by the ton. The value for oil is $45 to $55 per ton; for pickling $175 per ton. The pickling olives are picked by hand, while for oil purposes the olives are shaken off the trees.

The price of both olives and figs is continually rising. They represent one of the best investments that can be made.

Wherever I travelled in California I saw young olive plantations scattered throughout the State.

Fresno has the largest fig orchard in the world. J. C. Forkner has 7,000 acres of figs in one block. The chief varieties are the Adriatic and Smyrna. Both of these are used for drying, and the estimate of Fresno men is that they net $3 per producing tree.

It is a common sight to see a row of fig trees around a vineyard in the Fresno district. The figs are grown along the roads as avenues. Very few fences are seen in the Fresno district, as few stock are kept.



Homestead, Kearney Park, with Bachelors' Quarters in foreground.

The figs are dried on trays just in the same manner as the raisins. At Kearney Park there are 2,500 trees around the estate. These brought in a net revenue last year of $12,000.

The buyers purchase the figs on the tree, and take all the risks of harvesting themselves.

The trees are usually planted from 40 to 48 to the acre. The figs do not come into bearing until six to ten years after planting. That is the drawback to raising fig trees. The 2,300 trees on the Kearney estate average 110 tons of figs annually over a five year period.

The blastophaga insect has been introduced, so that the Smyrna figs set well in the Fresno district.

Features of Interest on Kearney Farm.

Among many features of interest on the property, the following might be mentioned:—

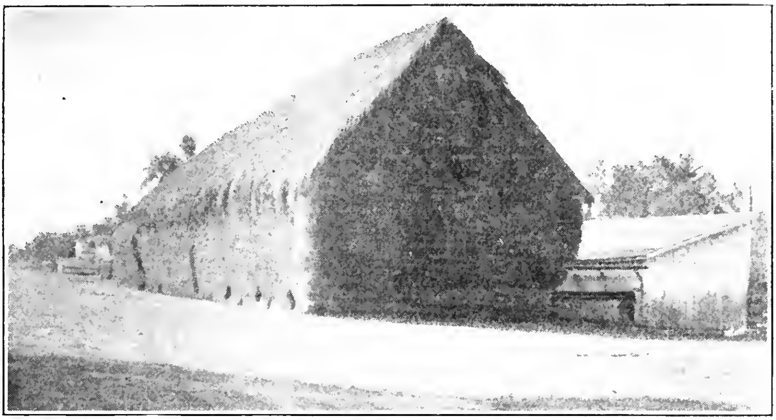
1. The excellent system of bookkeeping practice, which enables the management to detect all leakages and immediately correct them.

2. The organization of the farm labour. The ordinary farm-hands work from 7 to 5. Sixty-five to 300 men are employed, according to the season of the year. Provision is made for 25 families, and each family has a modern cottage. Single men are accommodated in barracks. The men receive $2 a day. There are eight "straw bosses," each of whom is in command of a company of eight to ten men. These straw bosses receive $60 to $75 per month and board. Over these is a foreman at $150 per month, responsible to the manager. The manager does all the buying and selling, and determines the policy of the farm.

3. The magnitude of the operations involved in the farm.

There were 800 acres of vines, 100 acres of olives, 1,000 acres of alfalfa, 1,200 acres of oats and barley.

The annual profit, after all expenses, interest, and depreciation were allowed, amounted to $60,000 per annum.



An Alfalfa Stack, 35 feet high, thatched with palm leaves.

4. Cotton has been grown on experimental plots for some years at Kearney, and now a company proposes to grow several thousand acres of long-stapled Egyptian cotton in the San Joachin Valley this year.

The cotton is planted in March and April, and is ready to harvest on 15th October at Fresno. The cotton would work in well with the staple crop vines.

Fourteen thousand excess hands are required to take off the raisin crop each year. The raisin crop is harvested by 15th October, so that, if cotton is grown, the period of employment for labourers would be greatly extended.

5. On this estate 160 acres of "alkali" land has been successfully reclaimed.

The surface foot of this land contained from 2 to 4 per cent. of salt and carbonate of soda.

Three years ago 25,000 feet of tile was used for draining—2 and 4 inch laterals and 6 and 12 inch main draws were used. The land has been successfully reclaimed and planted with alfalfa.

SUMMARY.

I asked Dean Hunt what he considered would be the future for agricultural education in California. He said that by 1922 he considered there would be 40 counties in the State, comprising practically all the farming area of California, with county advisor systems; there would be 400 bureau centres, with perhaps a membership of 20,000 farmers. Probably 100 of these farm bureaux would hold their meetings monthly in high school buildings, having present both the farm advisor and the principal of the high school, each an agriculturally trained man.

Two hundred high schools will have boys' agricultural clubs, in which 2,000 boys will actually raise some crop or animals under the supervision of the College of Agriculture. Each of these high schools will have a teacher of agriculture, who, instead of being an itinerant, will live in and work with that community, not only through the pupils of his own school, but also by organizing and supervising boys' clubs in the public schools of his particular territory.

Several thousand mature person, realizing that, to be effective, the educational process must be continuous, will be pursuing correspondence courses in agriculture. As the reading becomes more universal, and accurate information becomes more available, the daily and weekly papers will give greater space to agriculture, while books, circulars, technical journals, and reports on agricultural subjects will become a recognised part of every farmer's equipment.

He considered, too, that the College of Agriculture at Berkeley would have 1,000 regular students on its rolls.

At Davis he expected to see 500 farm school students, and another 500 taking short courses in agriculture.

At Kearney Park he hoped to have an organization that would give 200 students a real experience of farm life.

The Agricultural Experiment Station would grow to larger proportions, and become more specialized in its activity. Several hundred trained men would be working at this institution, delving after the truth in order that exact and accurate knowledge of agriculture may be obtained before it is passed on to the extension division to be broadcasted over the land.

The remarkable progress of Berkeley to-day is possible, because the pioneers who have gone before—Hilgard, Wickson, and others—have devoted their lives to discovering and classifying facts and knowledge upon which the superstructure of modern agriculture and horticulture rests. Little wonder that the grateful people of California have voted $350,000 to keep green the memory of their greatest scientist—Hilgard—the man who laid the foundations of scientific agriculture in California, and that his devotion to his work and the untiring efforts of his colleagues have made possible the present spectacular progress of Californian agriculture.

"Don't forget," says Dean Hunt, "to dig well the foundations for agricultural research, for without patient research, working over years, the basis for future development and progress cannot be laid."

Surely, in California's record, there is a message for Victoria.

APPLE CULTURE IN VICTORIA.

(Continued from page 213.)

By J. Farrell, Orchard Supervisor.

IRRIGATION.

The splendid results in fruit obtained in Victoria, and in other States of the Commonwealth, from the judicious application of water to orchard lands during the periods of the trees' growth, as well as those effected in other countries in which comparatively dry and warm climatic conditions similar to ours obtain, have so conclusively demonstrated the advantages of irrigation that the further advocacy of this practice would seem unnecessary. Nevertheless, there are still many districts in this State suitable for channel irrigation schemes which, notwithstanding the considerable sums of money required for their construction, could be established with incalculable advantages to our producers, and would prove a sound investment for the State. But even without this extension of the Government's irrigation schemes, apple production would be greatly increased if the dam system of irrigation employed by some of the fruit-growers in the undulating districts of central and southern Victoria were in more general use.

The dry, warm conditions experienced here during summer cause excessive evaporation from orchard land, and transpiration from the fruit trees, and thus quickly depletes the soil of the moisture accumulated during the previous winter. Owing to our comparatively light summer rainfall being usually insufficient to replenish these losses, irrigation is essential if the best results are to be attained.

Knowing that the trees absorb, in a state of solution, their food from the ground, it is obvious that the soil around the feeding roots should be kept sufficiently moist to maintain the solution during the vegetative periods, in order that the trees may be enabled to make good growth, fruit satisfactorily, and develop their fruit buds for the succeeding year.

Owing to the fluctuations of temperature and variations in the quantity and frequency of our summer rains, the quantity of water to be used, and the number of waterings to be applied to keep the soil in the necessarily moist condition, cannot be definitely fixed. However, the new settler commencing operations in a fruit-growing, irrigation centre, with the assistance of the departmental experts, by association with local irrigationists and by intelligent application to his work, should soon become acquainted with the principles governing the artificial application of water to the soil. When he thoroughly understands the climatic influences on the soil, the advantages of watering, cultivation, and the main requirements of his trees, irrigation, which, at first usually appears intricate, resolves itself into a rather simple proposition, provided good drainage exists, and that the soil be friable, and of a character amenable to general cultural treatment.

The rich friable chocolate soils occupying the pine ridge portions of the northern districts offer ideal natural advantages for irrigation, as they mostly overlie permeable clay subsoils which offer good natural drainage. Whereas, on other areas in close proximity to the ridges,

unfavorable conditions are often experienced. In the latter case the surface soils are of almost similar character to the former, but overlying impervious clays, are consequently not so suitable for irrigation on account of bad drainage. This condition, however, is usually rectified by the introduction of a system of sub-drainage.

Whether working under the former and more favorable conditions, or when he has overcome the difficulties in the case of the latter, the settler should make judicious use of the water, both in respect to quantity and number of applications, according to the requirements of his trees, and consistent with the regulations governing its supply.

The Channel System of Irrigation.

Our channel system of irrigation consists of a dam or weir placed across a river or other water course, causing the water to become banked up, and, at the higher level, deflected through a suitably placed

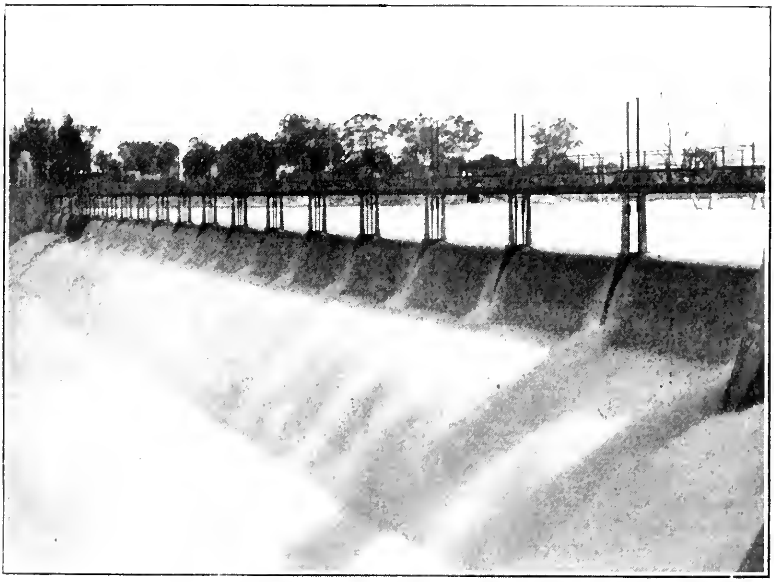


Plate 164.—A View of the Goulburn Weir.

delivery duct into a main articulation channel in which it is carried to the irrigation settlement. Having reached this point the water is diverted at suitable levels into the necessary number of smaller channels which, in turn, supply the individual orchard areas.

The State Rivers and Water Supply Commission controls our irrigation systems. The officers of the Department of Agriculture and Closer Settlement Board, &c., working in co-operation and harmony with those of the Commission have been successful in establishing irrigation settlement on sound and permanent lines.

From a study of the following illustrations depicting the weir, main articulation channels, smaller supply channels, and the furrow mode of applying the water, the reader will be enabled to gain a fairly compre-

hensive knowledge of the engineering in connexion with, and general principles involved in, the practice of modern irrigation.

Plate 165.—A Main Articulation Channel at Shepparton.

Plate 166.—A Main Articulation Channel entering an Orchard Settlement Area.

Plate 164 is a photograph of the Goulburn weir from which the Shepparton, Ardmona, Kyabram, Tongala, Rochester, &c., districts in the Goulburn Valley are supplied.

Plate 165 illustrates a main articulation channel at Shepparton settlement, which was brought under irrigation about ten years ago.

Plate 166 shows a main channel entering an orchard settlement area with the fruit trees situated to the right.

In localities where porous soils exist seepage from the channels is prevalent, but to prevent this, and protect land-owners in these places, the channels are constructed or lined with cement concrete.

The chief factors essential to successful irrigation, once the water is made available, consist of a perfectly graded orchard surface of deep, rich, friable soil, a permeable subsoil to afford good drainage, and the smaller supply channels conveniently arranged.

The virgin surfaces of the Goulburn Valley irrigation areas were almost invariably of naturally perfect grade, and where rare inequalities did occur these were of only minor importance and easily rectified. In other districts, however, owing to more serious surface inequalities considerable difficulties are experienced and expense involved in regulating the grade to irrigation requirements.

When all the preliminary arrangements have been completed and the water is made available for the orchard its application to the trees requires careful and intelligent management. Some years ago a practice often employed by irrigationists in the north was to flood the whole orchard area with water, when available, to a depth of from 4 to 6 inches, frequently irrespective of the condition of the soil or the individual requirements of the trees. Orchardists, who carelessly carry out this phase of their work, especially in situations where highly satisfactory results are difficult to obtain, set up soil conditions, even more inimical to the welfare of their trees than those previously existing. The experience of the writer, while inspector in charge of the Goulburn Valley irrigation settlements, as well as that gained by the settlers themselves, is that the furrow method of applying the water is the most economical and generally satisfactory system. By this means the operator is enabled to control the supply and apply the water in quantities to suit the different classes of soils in their then existing condition, and meet the requirements of the kinds and varieties of trees under treatment.

In connexion with the flooding method it may be further stated that a considerable quantity of water is lost through evaporation during warm weather. The flood on the surface is often visible for a considerable time, and its presence there almost prevents the escape from the soil's interspaces of the air, which impedes the downward percolation of the water. Cultivation contingent on irrigation becomes much more necessary in the case of soil drying up after flooding than when the furrow system is employed, because a considerably greater number of capillary vapour ducts is created in a given area treated under the former system than appears after the latter.

After flooding, particularly if the water be used sparingly on a surface with impervious sub-strata, which prevents rapid downward penetration, the undesirable condition of shallow rooting is encouraged. Whereas, when furrows are employed these may be ploughed to a suitable depth and the water controlled in them until such time as the subsoil is saturated, and more favorable conditions for lower root establishment thus created than would follow the flooding method.

In irrigating trees the first year after planting, two furrows, one on each side of the row, and about 2 feet away from the trees, are usually found the most suitable means for supplying the water to the best advantage. During the second and third years successively, however, the furrows may be ploughed according to the root extensions further and further from the trees to encourage the roots to radiate and extend their pasturage sufficiently.

Plate 167.—The Irrigationist at Work on the Two-furrow System of Watering.

Plate 167 illustrates the irrigationist at work and employing the two-furrow method of watering large trees. In this case the water enters the furrows through a break in the bank of the supply channel as indicated by the arrow.

This was the old mode of liberating the water, but the more modern method of discharge is by the employment of a narrow outlet box placed in the channel bank. The box may be made of galvanized iron or wood, and should be of sufficient length to allow it to protrude about 12 inches

beyond the channel bank at the delivery end. The box is fitted with a sliding gate at the intake to regulate the outflow.

Plate 168 shows the irrigationist adopting the four-furrow method of watering. Here the water is drawn from the channel through lengths of 2-inch galvanized iron piping placed in the bank at points as indicated by the arrows. When it is necessary to discontinue the flow of water from the channel, wooden plugs are placed in the intake ends, or the pipes may be drawn from the bank, and the opening in the earth closed in. Any old iron piping of the necessary diameter suits this purpose, and as regards cost, utility, and freedom of manipulation, this method is, in the opinion of the writer, preferable to the outlet box principle.

Plate 168.—Irrigationist adopting the Four-furrow Principle.

Plate 169 is a drawing showing the cross section of a supply channel and depicting the outlet pipe in the bank. The intake end of the pipe should be sufficiently low to insure a flow as continuous at those times when, owing to the working of a large number of outlets, the water falls as when it was at the highest level. The delivery end of the pipes should protrude at least 12 inches beyond the bank, and be near the surface level to afford easy access of the water to the furrows in which it is controlled and by means of checks and deviations distributed as occasion requires.

Cultivation Contingent on Irrigation.

Although the intelligent settler soon masters all the details connected with fruit-growing under irrigation, ultimate success can only

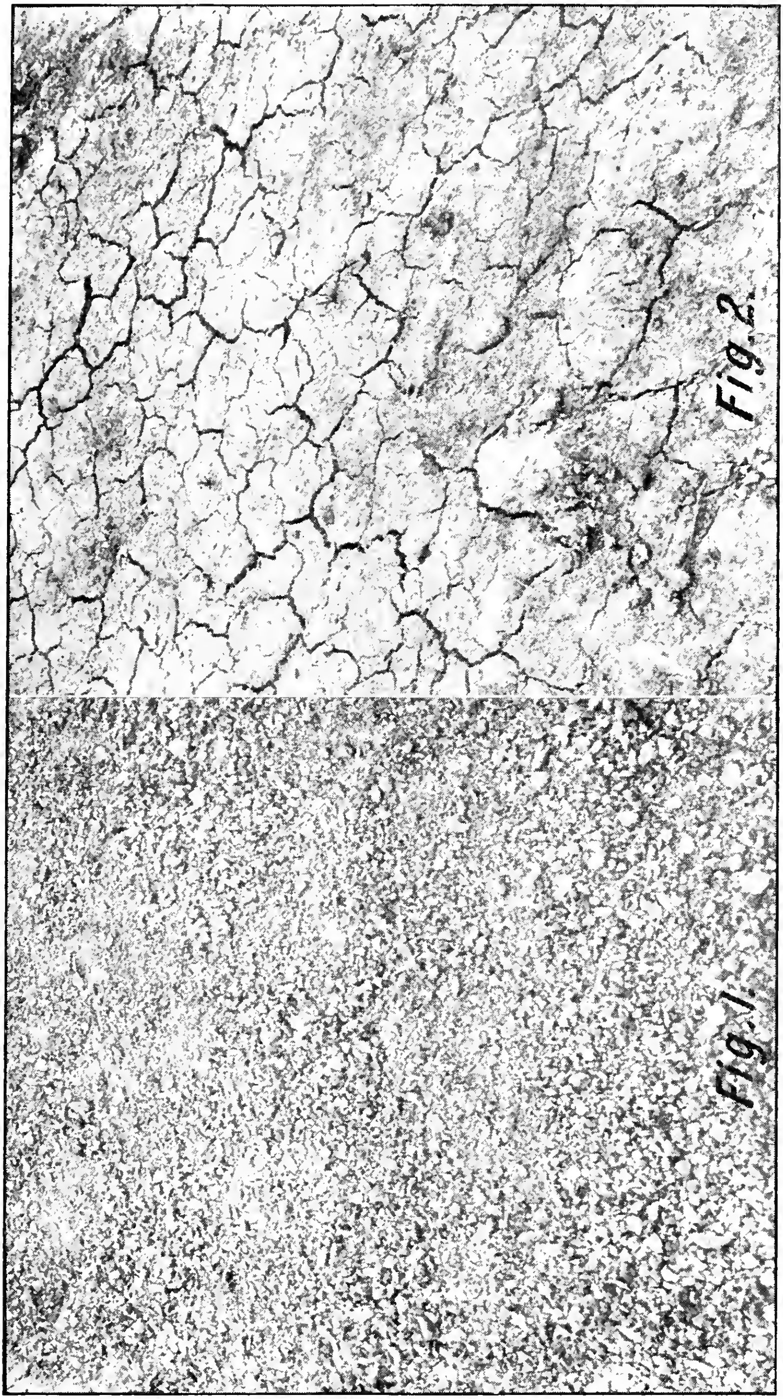


Plate 170.—The advantages of Cultivation after Irrigation.

Fig. 1.—Section cultivated with fine earth mulch.

Fig. 2.—The cracked surface after water lodgment.

be achieved through constant and strenuous effort. Of these details none can be regarded of greater importance than the cultivation contingent on irrigation. When the surface of the soil dries after each watering, it cracks, and the fissures act as capillary vapour ducts through which the moisture is drawn off into the air.

The more tenacious the soil the greater will be the extent of the cracking, especially in the irrigation furrows and in slight depressions on the surface of which undue water lodgment occurs. Before the necessary cultivation after each watering can be satisfactorily accomplished, it is essential that the soil should have assumed a fairly dry

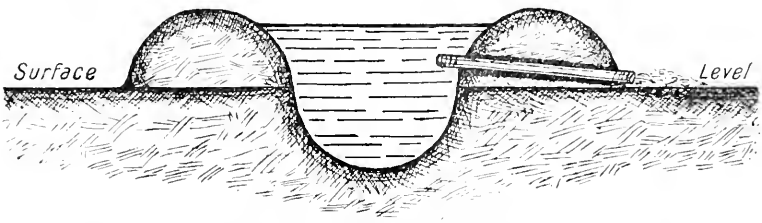


Plate 169.—Cross-section of Supply Channel showing position of Outlet Pipe.

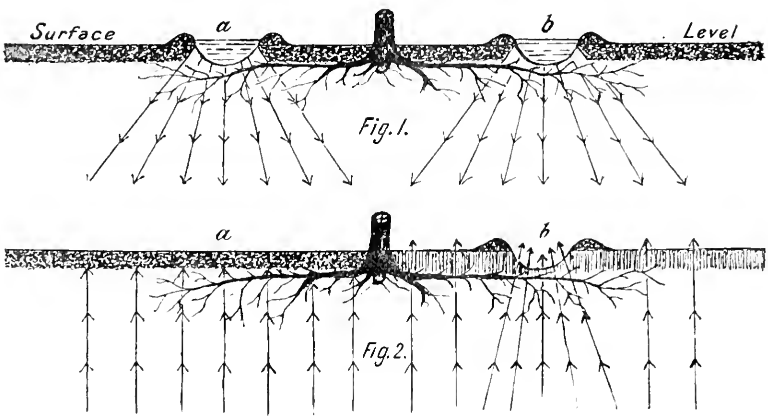


Plate 171.

Fig. 1.—Arrows represent downward percolation of water from furrows.

Fig. 2.—Arrows represent moisture being brought to the surface by capillary attraction.

state, and it is preferable that this condition should accrue from good drainage rather than from capillary action and evaporation.

Apart from the matter of cultivation at this time it should be remembered that the feeding roots are most active when there is just the proper percentage of moisture present, and that they suffer from excessive water to a degree corresponding with the duration of the soil's saturation. On the other hand, the healthy growth of the trees is retarded through lack of the essential solution in dry soil during the

period of vegetation, as long as this condition through want of water is allowed to continue.

The main objectives of cultivation after watering may be enumerated thus:—To destroy the surface cracks or capillary ducts, to aerate the irrigated portion, to produce a fine soil covering or mulch by means of which the moisture is conserved. The result is that a moderate amount of moisture is retained, and the quantity and number of waterings may be reduced. The disc cultivator and spring-tooth harrow are the best implements to employ when cultivating at this time.

Plate 170 illustrates the advantage of cultivation after irrigation. Fig. 1 shows a portion of cultivated land with fine soil mulch; Fig. 2 a portion of surface soil cracked after watering, and requiring cultivation.

Plate 171 is a drawing depicting in cross section a portion of irrigated land. Fig. 1 shows the position of the irrigation furrows (*a*) and (*b*), in relation to the tree, and the arrows represent the downward percolation of the water. Fig. 2 is the same cross section showing the advantages of cultivation after watering, as compared with the undesirable condition created through neglect of same. The portion of surface on the left of the tree and marked (*a*), having been reduced to fine earth, prevents the escape of the water. The arrows under this portion represent the capillary ascent of the moisture, which, being conserved by the earth mulch, is made available to the roots. The uncultivated portion (*b*), on the right of the tree, shows the capillary ducts, which are usually most numerous in the furrows and other surface depressions. The arrows in this case also represent the moisture which, for want of a mulch, passes through the ducts into the air.

(*To be continued.*)

BEES AND FRUIT.

An Agricultural Society of Florence, Italy, has recently carried out a thorough investigation of the alleged injury of fruit by bees, and has completely exonerated the latter. Bees are unable to perforate the skin of fruit, and it is only incidentally that they suck the juices of fruits injured by other natural causes. The damage sometimes attributed to these insects is due to poultry, wild birds, wind, and hail, and even more frequently to hornets, wasps, vine moths, and other insects.

Instead of being harmful to orchards and vineyards, bees perform the useful service of effecting the cross-pollination of flowers and hence the setting of fruit, as well as the desiccation of damaged fruits (especially grapes) by sucking the juice and pulp, and thus preventing fermentation and rot extending to sound individuals. The orchards and vineyards frequented by bees give the most constant crops.—*Scientific American.*

REVIEW OF THE BUTTER EXPORT SEASON.

The Annual Conference of the Australian Butter and Cheese Factories Managers' Association concluded a four-days' session at Melbourne on the 17th May.

At the meeting on the 14th May the following review of the butter export season was made by Mr. R. Crowe, Exports Superintendent:—

Although great hopes were entertained at this time last year, the past season has been disappointing. The exports totalled 11,042 tons, having a c.i.f. value of £2,009,644, against 14,099 tons, worth £2,763,598, for 1916-17.

The total exports of butter from Victoria since the inception of the trade in 1889 has now aggregated 338,726 tons, having a value of £37,940,079.

Various causes may be assigned for the recent season's disappointing results. The climatic conditions were such as to make the season later than was expected, whilst in one of the principal dairying districts a pronounced shortage in production has recently taken place, following on the dry weather experienced.

Although the Department of Agriculture has consistently urged the conservation of fodder, we find that most of the silos in the country are at the present time empty, whilst some of the structures have actually been dismantled. Upon looking for a reason, it is discovered that dairying in the winter-time does not pay as compared with the spring and summer months. It is well known that the production of butter on a large scale in the winter-time involves the cultivation of the land, the purchase of seed, the harvesting and saving of crops, as well as labour in feeding the stock. In addition, in many instances the purchase of fodder (such as bran, &c.) has been necessary.

It is estimated that it costs at least 50 per cent. more to produce a pound of butter in the winter-time than during the spring and summer months. Manufacturing costs are also higher. It is obvious that when a factory is turning out two tons of butter per week, the cost of manufacturing each pound is higher than if the factory output be ten tons per week. The manager, secretary, and engine-driver receive the same rate of pay per week in the winter as during the summer, whilst the cost of fuel and cartage cannot be correspondingly reduced with the smaller output. Thus, it will be seen that, if the same price rules during the slack period of the year as in the summer and spring, there is a smaller amount available for distribution amongst producers after manufacturing costs have been provided for.

The slight increase recently fixed for the winter months, as compared with the rest of the year, has had little effect in remedying the existing artificial state of affairs.

For the four years 1911-14 the arrivals of butter in Melbourne for the months of May, June and July averaged 2,828 tons; whilst for the last two years, 1916-17, the average arrivals for the corresponding period were 1,595 tons. I have purposely left out the drought year of 1915 in this comparison. For the four years 1911-14 there was an average of 655,523 dairy cows in Victoria, whilst for 1916 there were

488,016. It is estimated that for 1917 the numbers were about 512,000,* making an average of 500,000 for the last two years. On this basis, the average production for the last two seasons during the winter months of May, June and July should have been 2,157 tons instead of 1,595 tons, so that it will be seen that the winter production of butter per dairy cow in the State has fallen off by about 25 per cent. The conditions of the last two winters compare favorably with the four winters used as the basis for comparison. I repeat that "the figures for the drought year, 1915, have been omitted," and the figures for the present year, which has been abnormal, are, of course, not yet available.

GRADING AND GRADE STAMPING.

The basis upon which butter was sold to the Imperial Government and dealt with by the Commonwealth Government during the past season was an inducement to manufacturers to improve the quality of their butter. A price was fixed for 90 points butter, with 1s. per cwt. per point lower for every point below 90 points, and 1s. per cwt. more for every point higher than 90 points; in other words, butter which scored 94 points was paid for at the rate of 6s. per cwt. more than for butter scoring 88 points. Butter factory managers, directors, and dairymen should, in consequence, have been galvanized into action in order to improve the quality of their output. Those who have not done so have had to suffer the consequences, whilst those who made the effort have been amply repaid. All the butter dealt with during the past season has been grade stamped.

The work of grading dairy produce under the Commerce Act and Regulations was carried on for the Commonwealth since the coming into operation of the Act in 1906 until January last by officers of the State Department of Agriculture. On the 1st February last, however, this work was taken over by the Commonwealth, and the whole of the grading staff transferred to the Commonwealth service. Consequently, I have been left without any grading or instructional staff. The Commonwealth authorities promised to give the State copies of all grade certificates, as has been done in New South Wales, to enable instructional work arising out of the grading to be carried on. So far, not one certificate has been received, although repeated requests for them have been made.† The reason given for the omission is that copies of certificates may not be given without the approval of the factories concerned. This might be considered a sufficient reason where outside firms or factories are involved, as none of them have a right to such information. It is different, however, in the case of a State where the information is required officially for instructional purposes.

By the State authorities it is considered that it is not the function of the Commonwealth Customs Department to undertake the work of instruction in dairying of the manufacture of dairy products. These

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* Since these estimated figures were used "the return of live stock in Victoria" by the Government Statist has been made available, showing that there were 534,388 dairy cows in the State. This number gives an average of 511,237 for the two years instead of 500,000. The average production should therefore be stated as 2,205 tons instead of 2,157, and consequently the falling off is nearly 30 per cent. in place of the 25 per cent. taken as the basis of my estimate.

† By letter dated 29th May, 1918, received by the Director of Agriculture from the Acting Comptroller-General, Department of Trade and Customs, it is stated "that as the approval of the Victorian Factory Proprietors to the furnishing of the certificates in question has now been unanimously obtained, arrangements have been made for copies of the grade certificates to be supplied to you as from the 1st proximo."

duties are clearly within the scope of the State Department of Agriculture.

At the suggestion of the Conference of Ministers of Agriculture last week, the Premiers' Conference now sitting decided that similar legislation should be introduced in each State in order to meet the circumstances arising out of the recent Commonwealth action. In New South Wales and Queensland legislation relating to the dairying industry provides for the necessary organization and staff for the giving of instruction arising out of the grading. In Victoria all the staff was taken over; hence a blank was created which it is intended to fill at the earliest possible moment.

Discussion by Members.

In the discussion which followed, a member, referring to the failure of the Commonwealth authorities to supply the State with certificates, said that two months ago his factory had written stating that they were agreeable to the Commonwealth handing over these documents, seeing that they were necessary for the purposes of instructional work, and in their absence the State would be hampered.

Another member stated that the majority of the factories had expressed a wish that these certificates be given to the State authorities, and asked what action was contemplated in the matter. New South Wales and Queensland, he said, seemed to be moving in the direction of giving instruction.

Mr. Crowe.—The States affected now propose taking steps to pass a Bill providing for the carrying out of instructional work generally, and particularly instructional work arising out of the grade certificates. That did not insure the handing over of grade certificates by the Commonwealth to the State. As far as could be gathered, no approval was asked by the Commonwealth authorities in New South Wales to hand these certificates over.

A Delegate.—Has the State Department no knowledge of how things are going with the Commonwealth Department regarding the grades?

Mr. Crowe.—No knowledge whatever. I consider a request by the Conference to hand over copies of the grade certificates would have some effect.

A Delegate.—Yes; if followed up by a deputation to the Minister, otherwise the matter might be shelved.

The Secretary.—Since the Federal control, the issue of weights of butter had been discontinued. If factories supplied the correct weight they were all right, but in the event of the weight being in excess, they got no enlightenment.

A Delegate.—The Conference should make a move in some way if it is likely to bear fruit. It has been a general thing for application to be made to the Federal expert to give the required returns to the State Department, but apparently all of the individual requests have been shelved. In his own case application had been made to have the information given to the State.

Mr. P. J. Carroll.—Without taking any responsibility as a Federal servant, I might state that the whole of the factories have not replied to the Federal circular—not more than 50 per cent. having done so—on the subject. Regarding the secretary's remarks *re* weights, as far

as I am aware, the practice has not been altered, and the same information has been conveyed to the factories as hitherto.

The SECRETARY.—In my company's case, there is no indication as to whether the weights are right or wrong. In the past this was shown.

Mr. P. J. CARROLL.—If that be so, it was unintentional.

A DELEGATE.—Can Mr. Crowe give the amount of butter of various grades until the Commonwealth took the matter over?

Mr. CROWE.—No. When the Commonwealth Government took the business over all books and papers in connexion with the subject were handed to them.

A DELEGATE.—It lies with the factories themselves in not replying to the Federal circular on the subject of permission to hand over the certificates, seeing that only 50 per cent. have not furnished a reply. Under the circumstances, the Federal people might refer the matter back, with an intimation that they were awaiting replies to their circular from the other 50 per cent. We consider the State has been just in its action, which has been an education to us, and we consider that the rights of the State in the matter have been unduly interfered with.

The CHAIRMAN.—I understand that in Mr. Crowe's opinion, power exists without referring it back to the factories at all.

A DELEGATE.—In New South Wales they are doing it without consulting the factories.

MOTION OF PROTEST.

On the motion of Messrs. Martin (Apollo Bay) and Adamson (Moe), it was decided to protest to the Commonwealth authorities regarding the State Dairy Departments not being furnished with copies of the grade certificates.

WINTER DAIRYING AND PRICE FIXING.

A DELEGATE.—Regarding Mr. Crowe's statement as to the increased cost of manufacture of butter in winter as against summer production, I sent figures to the Food Prices Board. In connexion with Mr. Crowe's investigations some three or four years ago in the Camperdown district, many thought his conclusions were scarcely correct, but upon going into them, I found that was not so. I discovered that the average farmer, renting land and taking his family and all in, was undoubtedly the lowest-paid wage-earner in the State. Although during the past year or two the prices have been a little better, there must of necessity be a change in the matter of production, otherwise more dairymen will go out of the industry. This is the tendency in my district, and, I believe, also applies elsewhere.

A DELEGATE.—I can bear out Mr. Crowe's statement as to the falling off in butter production in the winter. In my district at one time several suppliers tried to extend dairying during winter, but owing to the disappointing returns covering the last two or three seasons, in several instances I have been informed they intend going out of dairying in the winter and confining their operations to the spring and summer time, when the production is better and the cost less to them. Unless something be done to encourage winter production, the shortage will become greater as the years go on.

Mr. CROWE.—Following up this particular subject, I may mention that dairymen in Victoria have never received a price in winter-time that paid them as well as the prices ruling in the spring and summer time. This is due to the supplies obtainable from other parts of the Commonwealth, particularly Queensland. Under these natural conditions dairymen were content to produce as much as possible in the winter-time. Since the regulation of prices, however, whereby they get no more for what they produce in the winter than in spring and summer time, their attention has been focussed on the subject; they feel unjustly treated, and this is how the most harm is done. If the outcome be that indicated by the previous speakers, it would appear that if the winter production grows less, each State should, in the opinion of some, provide from the season of plenty sufficient butter to carry its people through the slack period. Should this course be taken, we will have factory butter going into store in December and January in order to be available for consumers during the months of May, June, and July. In May, June, and July the storage and interest on capital would require to be paid, and if consumers require to be protected in that way, they should buy the butter, pay for it, and bear the risk of the transaction; it should not be the producer's risk. (Hear, hear.) In South Australia, each year a considerable quantity of butter is exported, and when the export season is over they draw their supplies from Victoria, and the consumers in South Australia have the privilege of eating fresh instead of stored butter. (Hear, hear.) If it be competent for South Australian consumers to have the privilege of obtaining fresh instead of stored butter, it is legitimate for Victorian consumers to draw supplies of fresh butter from Queensland. At the present time there is sufficient butter being produced in the Commonwealth to cover all requirements, and, further, if price fixing were left alone, the price at present would not be very different from what it actually is. The people in Queensland naturally were glad to dispose of their butter, but since the price has been fixed, they cannot be blamed for not selling below that price. (Hear, hear.) This would not help winter dairying in Victoria, but dairymen would be more happy if the irritating artificial restriction were removed.

A DELEGATE.—I find from inquiry that in my district during the past season 860 cows have actually been withdrawn from production, having been disposed of in the saleyards, &c. This represents a big loss to the dairying industry. My investigations show that many have gone out of the dairying business, because they say that by grazing and fattening sheep they can get equal results. Price fixing is their grievance, with the result that they have taken on something else with an attendant easier life. The other night I attended a political meeting, and one of the speakers stated then that he believed in equal pay for both men working long and short hours, and gave out the statement that the average pay of the workman in Melbourne to be £2 15s. per week. I inquired of him if a dairyman working sixteen hours per day should be paid according to his work, to which he replied in the affirmative. Whereupon I asked why, with Mr. Tudor, he advocated price fixing, so that the dairyman could not earn half the pay of the people whom he was representing. (Laughter.)

The SECRETARY.—We are interested to know what work is about to be undertaken by the State Department towards imparting instruction

amongst the farmers of the State to maintain a good supply of cream to the factories, also for information and instruction regarding the treatment of dairy produce. It has frequently been pointed out at previous conferences that the amount of instruction offered is infinitesimal, and the country is looking forward to an awakening of the Department of Agriculture, and its starting on active propaganda for the purpose of putting the dairying industry on a better footing, and imparting information bearing on dairy produce generally. It is necessary that the factories receive the best raw material. Perhaps Mr. Crowe might have something to say on the subject.

Mr. Crowe.—It may be mentioned that only 34 per cent. of the butter produced in Victoria during the last number of years has been exported, so that only that percentage of the total output was likely to come within Commonwealth control. The Commonwealth Government, under its Commerce Act and Regulations, undertakes to deal with exports, and its control commences when dairy produce is entered for export. Sixty-six per cent. of the production is consumed locally. Over a number of years only 6.3 per cent. of the cheese manufactured in the State has been exported, the other 93 per cent. having been consumed locally, so that but a small proportion of what is produced is likely to come under the control of the Commonwealth authorities. All of the milk produced for local consumption requires supervision under State authority. In Queensland there is in force a Dairy Products Act, which came into operation about 1905. For the last two or three years in New South Wales they have had in operation a Dairy Industry Act, which was passed as the result of a conference of Ministers of Agriculture held in Brisbane about four years ago. At that conference the Victorian Minister also promised to endeavour to get a Bill passed in Victoria, so that all of the States would be working on uniform lines. I can assure you he endeavoured to introduce this Bill, but for some reason or other (I think you all know the history of it, the Cream Grading Bill), it was side-tracked from time to time. The measure now contemplated will be similar to the Cream Grading Bill, but what its title will be remains to be seen. At the Conference of Ministers last week, the Directors of Agriculture from most of the States were present, whilst the officers of the Department connected with dairying were all represented. A meeting was held, and the good and weak points of the Queensland and New South Wales Acts were fully considered. It was agreed that from those Acts, which had been in operation for many years, and the material contained in the Victorian Cream Grading Bill, there would be no difficulty in framing a Bill right up to date, which could in no way be regarded as experimental. (Applause.)

A Delegate.—Regarding the 34 per cent. of the Victorian butter exported, &c., is all butter on the local market controlled by the Federal graders?

Mr. Crowe.—At present, they have control under the War Precautions Act. After the war, it is considered they will be unable to exercise that power.

A Delegate.—How does the output per cow per year for the last year compare with years before the drought?

Mr. Crowe.—I have not any figures for the last year, but may mention that, according to the Commonwealth Year-Book (No. 9, 1916,

p. 371), the average butter per cow in Victoria and the Commonwealth was as follows:—

Year.	Average for— Victoria.	Commonwealth.
1910	126	119
1911	146	120
1912	130	114
1913	142	121
1914	136	121
1915	135	111

These are the latest figures available on the subject.

In replying to a vote of thanks, Mr. Crowe said that in mentioning the question of price fixing, it must be clearly understood that he had no desire to enter into subjects which might be regarded as of a political nature. He had drawn attention to these matters because he considered it to be his duty to point out anything happening from time to time which affected the dairy industry.

FALLOW COMPETITIONS.

Report of Mr. H. A. Mullett, B. Ag. Sc., Judge of the Fallow Competitions Conducted by the Goroke Agricultural and Pastoral Society.

Herewith I am forwarding my report on the judging of the recent Fallow Competition held under the auspices of your Society at Goroke.

An examination of the soils of the Goroke district showed that widely differing types exist; more often than not, two or three types were found in the same paddock. This rendered the judging a matter of considerable difficulty, since there were only two sections in which competitors' fallows could be placed. The rule adopted was to place the exhibit in the class to which the larger portion of the soil belonged. The following were the main classes of soil met with:—

(1) Friable black clay loams (as at Pleasant Banks).
(2) Friable sandy loams (as at The Hummocks, Mr. Lees).
(3) Stiff clay loams, frequently crabholey (as at Mr. Studholtz).
(4) Fine sandy soils containing a proportion of silt, with a tendency to set down badly, and frequently with a cementy subsoil (as at Mr. Cameron's).

The correct method of working several of these soils is totally different; the first two can scarcely be overworked, but the fourth must be treated with extreme care to avoid puddling; and, while the third will stand a fair amount of work, some judgment is necessary to find the right time for dealing with it. Generally speaking, the crabholes are either full of water or as hard as blue metal.

In considering the merits of each fallow, the amount of work advisable to meet the peculiarities of the class of soil was taken into account. A natural tendency on the part of competitors on the various classes of land to advocate the general extension of their own particular methods to all types of soil, was noticeable. Thus, those with friable

loams are staunch advocates of plenty of work, while many of those with cementy sands aver that no working other than ploughing is necessary on the fallows, and that anything more is positively harmful. The chances are that, in certain cases, both opinions are right, but in others both are wrong; each piece of fallow must be worked according to its needs, and not by any rule of thumb.

Advantages of Conserving Moistures; Early Sowing Advocated.

There is a general agreement locally that the conservation of moisture at Goroke is unnecessary, owing to the heavy winter rainfall there, and that moisture so conserved—especially in sandy soils—will add to the waterlogging and puddling effect. But it can be shown that there are tremendous advantages in favour of retaining moisture in the fallow, and, further, that this extra moisture does not necessarily increase the puddling. The following is the justification.

Careful analyzes made from representative samples taken in the field at Goroke during the visit, has demonstrated that those soils (sands or clays) which were merely ploughed and left in the rough, or allowed to become hard and packed, whether after working or not, were practically bone dry. It follows, therefore, that there could have been no bacterial activity, so vitally necessary in producing available food for the plants. That this bacterial activity was lacking, is further evidenced by the fact that often the grass turned under at fallowing showed no signs of decay.

Again, it is of paramount importance at Goroke, where 13.47 inches of rain, out of a total 19.76, falls in the growing period of wheat (May-October), to sow early. The rainfall records for the past twenty years show that only every other year, on the average, does an inch of rain fall in April; while in June the average fall is 3 inches; and further heavy falls are experienced in July, August, and September. Thus, if there be no moisture conserved in the fallow, the light rains of April and May may not be sufficient for the working and the safe seeding of the soil; consequently, the farmer has to wait till June, when there is a grave risk of total loss of the seed or damage to the seedling crop. But, if the fallow be moist, advantage may be taken of light rains, which would otherwise be insufficient to start germination. An early-sown crop will make forward growth while the soil is still warm, and gets its roots well down into the warm soil beneath, and can defy frosts and excess moisture. A vigorous growth will not only draw water out of the soil, but will shelter it from the packing action of the rain, which is the real cause of the setting down of these sandy soils. The greatest quantity of moisture that could possibly be carried over under Goroke conditions would be equivalent, at the most, to 2½ to 3 inches of rain, and the greater part of it would be located in the subsoil, available to the plant, but out of harm's way. The whole of this moisture being already in the soil will not assist in packing, which, as already stated, is caused by the beating of the rain.

Throughout the judging, I have constantly borne in mind the necessity of conserving moisture, and have awarded points for moisture and for mulch; but I have been careful to remember that very little

working can be given to some soils. Consequently, where the mulch was entirely absent, points were heavily deducted; but if the mulch were too fine, and likely to set, or of too recent occurrence, similar loss of points followed.

I regret that, owing to the absence of several of the competitors at the judging, it was not always possible to obtain exact particulars as to the location of the area exhibited, or of the cultural operations given; and trust that any inaccuracies in this respect will be condoned.

The Results.

Light Class.

Name.	Moisture.	Character of Mulch.	Tillage.	Freedom from Weeds.	Totals.
Possible Points	50	50	50	50	200
G. Patching	20	45	45	40	150
J. Burton	17	40	40	40	137
A. Richards	17	30	40	40	127
J. Cameron	22	30	30	45	127
C. D. Block	5	25	40	45	115
T. Ough	..	..	25	45	70
M. Kiely	..	..	20	45	65

Mr. J. Patching, in this class, heads the list with 150 points. This competitor showed sound judgment in working his land, and in the character of the mulch that had been placed on the surface. The land was ploughed in July and August, 4 inches deep, with a Kubale stump-jump plough. After the spring rains at the end of October, it was worked with a spring-tooth, and again after rain at the end of February. The roughest section (a low-lying portion) has been disced recently, and plans have been made to plough a drain through the low-lying patch after seeding to carry off excess water. The moisture conserved was not as high as that in the land of Mr. Cameron, where portion of the soil is, however, heavier, and therefore capable of retaining more moisture.

Mr. Burton's fallow was on new ground, and was stated to have been broken up before the winter—in May—and then skim-ploughed in October with a Shearer cultivating plough. Mr. Burton's fallow did not show quite so much moisture, and there was a skin on the mulch.

Mr. Richards ploughed in September; he harrowed twice in October, and spring-toothed in February. The mulch was deep, but appeared to be rather finer than advisable.

Mr. J. Cameron showed a very interesting piece of fallow, the rain having interfered with the intended programme of work. The soil was light sandy, but there were patches of heavier clay loam. About half the paddock had been ploughed in August, and the remainder in September. Samples taken from adjacent parts disclosed the fact that

the earlier fallow had the more moisture. This portion received no subsequent working, and was comparatively dry; but a calculation from the analysis of the part of the fallow that had been mulched proved it to contain the most moisture of any exhibited in both sections. The mulch was satisfactory. Mr. Cameron lost points through not completing his working.

Messrs. M. Kiely and T. Ough had not worked their soil subsequent to ploughing. Mr. Ough's was very well ploughed, but both paddocks were very hollow, and practically contained no water of use to the plants.

Heavy Class.

Name.	Moisture.	Character of Mulch.	Tillage.	Freedom from Weeds.	Totals.
Possible Points	50	50	50	50	200
J. Delaney	41	45	40	45	171
J. Lees	43	45	45	30	163
F. O. Robertson ..	46	40	35	40	161
C. O. Block	11	20	35	45	111
J. Molloy	11	..	20	35	66
N. Tully	8	25	25	35	93
J. Studholtz	..	10	22	35	67

The first three competitors had a decided advantage over the remainder, in that the class of land they showed was easier worked. The entries of Messrs. Robertson and Delaney were in the same paddock, and, in the absence of either, it was not known to whom each portion should be credited. The whole was classed as strong ground, and the northern half was credited to F. O. Robertson, and the southern half to J. Delaney.

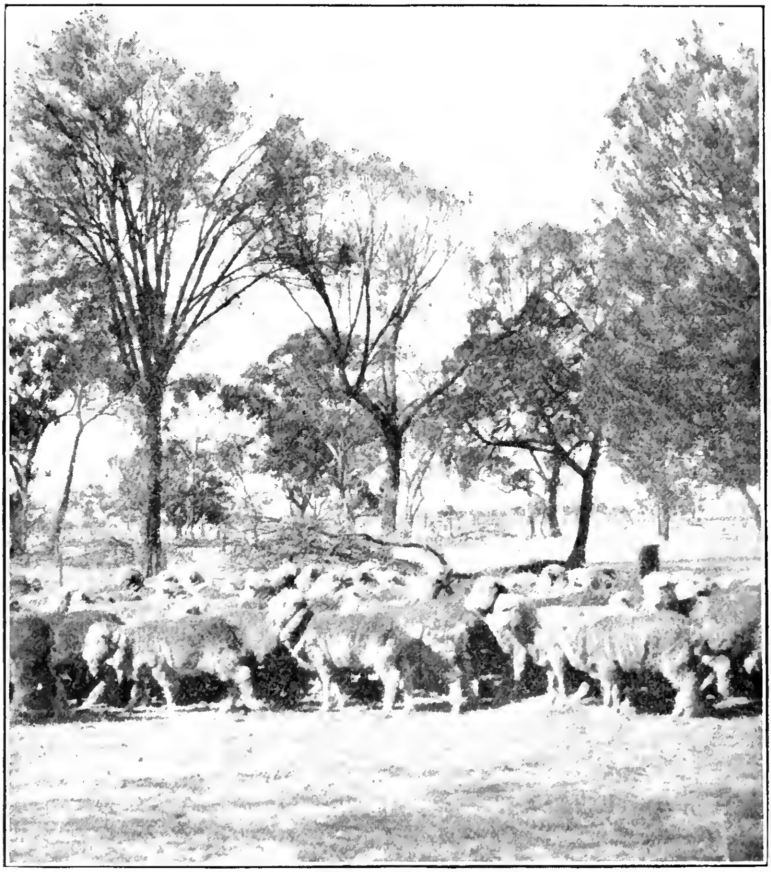
Mr. Delaney's exhibit, a good friable black-clay loam, was stated to have been ploughed in August and September; then harrowed and cultivated before harvest; and spring-toothed in February. There was a good mulch, and calculations from the moisture analysis showed that it contained a considerable amount of moisture, but not so much as Mr. Robertson's fallow; there was, however, a comparative freedom from weeds.

The fallow shown by Mr. Lees was portion of a rich black sand hummock. There were high moisture and a good mulch, but paddy melons were present, although, judging by appearances, attempts had been made to remove them. It was stated that this area had received several ploughings with the object of getting rid of horehound and paddy melons.

The remaining fields were considerably lower in available moisture, and the problem of their preparation and working is considerably more complex than that of the first three.

Mr. Block had worked his land once after ploughing in November and December, and had not touched it again; there was very little effective mulch.

Mr. J. Molloy, with some stiff crabholey clay, had not worked it since ploughing; and Messrs. Tully and Studholtz had merely harrowed the land once, without creating a satisfactory mulch.



Typical Goroke Country.

Summing Up.

Suggestions.

It would seem that the last milepost on the way towards the most effective working of Goroke fallows has not been reached. The best methods will only develop as the result of intelligent inquiry, in which the present movement should assist. Having regard to the economic conditions of your district, I would say to those who have friable free soils, that increased working of the fallows, with the storage of water,

and the stimulation of the necessary bacterial flora as the object, would prove payable. To those who have strong, crabholey country, it is suggested that it would become more manageable if the gradual filling in of the crabholes were aimed at by substituting some sort of land grader for the harrows at one working each year. To those with the light sandy cements, perhaps the best advice is, "Work the soil, but not too much. Give it at least two workings—one after the spring rains, and one after the summer rains—with an implement such as the spring-tooth or the cultivating scarifier, *i.e.*, one that will tend to leave the lumps on top and preserve a nubby mulch." This class of soil sets very quickly after the rain, and judgment is required to select the right time for working it. If settled wheat growing, and not just grass improvement, be aimed at, it may ultimately prove payable to grow field pease as a catch crop on these "cementy" fallows, and allow sheep to pick them up when ripe. The fallow would certainly be no drier after having grown the pease than it becomes under present conditions. The residue of the pease crop, together with the sheep droppings, would rapidly improve the texture and water-holding capacity of the land. Another legume which could be substituted for pease would be the King Island Melilot. The sowing of a few pounds with the wheat might possibly provide a fair quantity of feed in the stubbles, and, when ploughed in, would improve the texture of the soil.

To all, I would suggest that greater attention be paid to the seed. The varieties used should be select-bred, and of proved prolific strains. For early sowing, later-maturing types—such as Yandilla King, Major, Penny, or Currawa—should prove best; while, for late-sowing, early-maturing varieties, like Gluyas, are worthy of a trial.

The quantity of superphosphate used, viz., 90 to 100 lbs., seems to be on the right lines.

In conclusion, I have to thank those gentlemen who kindly lent their cars so that judging might be expedited; also those farmers, whose homesteads were visited, for their generous hospitality.

At the Peshawar Agricultural Station in the north-west frontier province of India, Federation wheat has, according to the *Agricultural Journal* of India, been grown during the past two years. It has demonstrated its capacity to outclass local varieties in yield, even under the special climatic conditions that obtain at Peshawar. For the past two years it has beaten all other varieties.

The province is noted for its low rainfall, which it is generally necessary to supplement with irrigation. In 1916 the rainfall during the growing period of wheat was 5 inches, and it was necessary to give the wheat three irrigations.

Federation is especially commended by the station authorities for its remarkable upstanding qualities, and, strange to say, its resistance to smut and rust as compared with local wheats.

STANDARD COWS.

REPORT FOR QUARTER ENDING 31st MARCH, 1918.

Eighty-eight cows in all completed their milking term during the quarter. Four failed to yield the requisite amount of butter fat. The names of the remaining 84 standard cows, with their records, appear below.

J. BAKER, Gheringhap. (Red Poll.)

Completed since last report, 2. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Elcho Lady ..	Not yet allotted	30·4·17	7·5·17	273	23½	7,028	4·84	340·11	250	387¾
Elcho Maid ..	,,	25.6.17	2.7.17	273	9	5,510	5·13	282·51	250	322

Mrs. AGNES BLACK. (Jersey.)

Completed since last report, 9. Certificated, 9.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Grey Girl ..	2064	4.4.17	11.4.17	273	8½	4,859	5·63	272·25	250	310¼
Marguerite ..	3576	8.4.17	15.4.17	255	4	6,292	4·87	306·39	250	349¼
Beauty of Candelo II.	3739	10.4.17	17.4.17	273	11	6,585	4·46	294·15	250	335¼
Flashlight ..	1972	19.4.17	26.4.17	253	4	6,221	4·77	296·95	250	338½
Heatherbell ..	3574	21.4.17	28.4.17	273	12½	7,029	4·42	310·61	250	354
Sheila V. ..	3580	26.4.17	3.5.17	273	6½	4,686	5·40	253·06	250	288½
Carnation V. ..	3572	26.4.17	3.5.17	246	4	4,767	5·62	268·08	250	305½
Mona's Pearl ..	3577	7.5.17	14.5.17	273	6	6,611	5·07	335·57	250	382½
Madge	3575	19.5.17	26.5.17	251	4	5,903	5·45	321·75	250	366¾

DEPARTMENT OF AGRICULTURE, Werribee. (Red Poll.)

Completed since last report, 16. Certificated, 15.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Baltica	Not yet allotted	4.4.17	11.4.17	273	22½	8,512	4·31	366·95	250	418¼
Anglia	,,	20.4.17	27.4.17	273	20	6,790	3·79	267·66	175	305¼
Lily	,,	24.4.17	1.5.17	273	19½	7,651	4·10	313·46	250	357¼
Kubanka ..	,,	3.5.17	10.5.17	273	23	7,223	4·27	308·65	175	351¾
Avesia	,,	6.5.17	13.5.17	273	26½	8,231	4·06	334·51	200	381¼
Laranga ..	,,	16.4.17	*14.5.17	257	16	4,780	4·15	198·63	175	226½
Africana	,,	8.5.17	15.5.17	273	11½	5,622	4·74	266·76	250	304
Soudana	,,	16.5.17	23.5.17	273	18	7,113	4·16	296·39	250	338
Orinoco	,,	22.5.17	29.5.17	273	10	5,823	4·26	248·20	175	283
Nictitana	,,	†24.5.17	1.6.17	221	4	3,587	5·04	181·31	175	206¾
Nickahoe ..	,,	26.5.17	3.6.17	273	14	5,807	4·32	250·79	175	286
Muria	,,	6.5.17	‡13.6.17	266	4	7,293	5·57	406·10	250	463
Morocco	,,	7.6.17	14.6.17	273	22½	8,421	3·65	307·35	175	350¼
Latakia	,,	11.6.17	18.6.17	273	26	7,421	4·72	350·56	200	399¾
Hollandia ..	,,	16.6.17	23.6.17	273	14½	5,447	4·53	247·04	200	281½

* Lost first 16 days on account of sickness.
† Calved 3 months prematurely.
‡ Entry deferred 3 weeks owing to milk fever.

C. FALKENBERG, Elliminyt. (Jersey.)

Completed since last report, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Annie of Taringa ..	4023	29.5.17	5.6.17	273	8½	4,803	5·65	271·18	250	309¼

GEELONG HARBOR TRUST, Marshalltown. (Ayrshire.)

Completed since last report, 2. Certificated, 0.

Mrs. A. C. GIBBS, Bamawn. (Jersey.)

Completed since last report, 3. Certificated, 3.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Boronia of Springhurst	4377	23.5.17	30.5.17	253	4	4,558	5·54	252·56	250	288
Musk of Springhurst	4388	29.5.17	5.6.17	273	10	4,482	5·77	258·61	250	294¾
Hyacinth of Springhurst	3705	30.5.17	6.6.17	273	10	4.974	6·30	313·17	250	357

W. C. GREAVES, Monomeith. (Ayrshire.)

Completed since last report, 2. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Grace II. of Warrook	2908	3.4.17	10.4.17	273	15	6,669	4·93	328·87	250	375
Future of Warrook	2244	25.4.17	2.5.17	273	20½	8,885	4·02	357·18	250	407¼

T. HARVEY, Boisdale. (Jersey.)

Completed since last report, 3. Certificated, 3.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Lady Marge V. ..	Not yet allotted	3.4.17	10.4.17	273	14	4,868	5·80	282·64	175	322¼
Kirsty V. ..	4100	17.6.17	24.6.17	273	18½	6,211	5·58	346·40	200	395
Sparkle	2978	21.6.17	28.6.17	273	17½	5,875	5·35	314·18	250	358¼

A. W. JONES, Geelong. (Jersey.)

Completed since last report, 2. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Lady Grey I. of St. Albans	4186	20.4.17	27.4.17	273	14	5,899	6·85	404·05	250	460½
Lady Grey VIII. ..	4187	5.6.17	12.6.17	273	26	9,430	4·87	459·31	250	523½

C. G. KNIGHT, Cobram. (Jersey.)

Completed since last report, 3. Certificated, 3.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
My Queen of Tarnpirr	4209	27.4.17	4.5.17	273	17½	5,775	5·82	335·94	200	383
Mistletoe of Tarnpirr	2984	6.5.17	13.5.17	273	25½	7,630	5·13	391·49	250	446¼
Romany Lass ..	2563	15.6.17	22.6.17	273	22	6,543	5·54	362·72	250	413½

C. G. LYON, Heidelberg. (Jersey.)

Completed since last report, 10. Certificated, 10.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Chorus	2823	31.3.17	7.4.17	273	17	7,309	5·62	411·35	250	469
Hawthorn V. of Banyule	Not yet allotted	6.4.17	13.4.17	273	14½	5,247	5·46	286·37	175	326½
Hawthorn of Banyule	1064	8.4.17	15.4.17	273	13	6,920	5·21	360·66	250	411¼
Noble's Pet ..	4247	14.4.17	21.4.17	273	16	5,847	5·36	313·61	175	357½
Soprano	1395	28.4.17	5.5.17	273	17	7,874	5·88	463·86	250	528¾
Pretty May (imp.) ..	3103	3.5.17	10.5.17	273	12½	6,024	5·38	323·97	250	369¼
Milkmaid 37th ..	1222	14.6.17	21.6.17	273	21½	8,639	4·77	412·55	250	470¼
Velveteen II. ..	2927	15.6.17	22.6.17	273	27	10,434	4·67	487·73	250	556
May IX. of Banyule	Not yet allotted	22.6.17	29.6.17	273	16½	5,251	5·00	262·81	175	299½
May X. of Banyule	,,	22.6.17	29.6.17	273	13½	4,527	4·94	223·57	175	254¾

T. MESLEY, Dalyston. (Jersey.)

Completed since last report, 3. Certificated, 3.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Daisy of Springhurst	1788	19.4.17	26.4.17	273	12	6,300	5·54	348·08	250	396¾
Euroa of Springhurst	1918	12.5.17	19.5.17	258	4	4,920	5·52	271·41	250	309½
La Charme ..	Not yet allotted	9.6.17	16.6.17	273	20½	5,577	5·01	279·52	200	318¾

J. D. READ, Springhurst. (Jersey.)

Completed since last report, 15. Certificated, 15.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Banksia of Springhurst	Not yet allotted	31.3.17	7.4.17	273	9½	5,115	5·59	308·32	175	351½
Infanta of Springhurst	,,	21.4.17	28.4.17	273	9	4,946	5·69	281·24	175	320½
Trefoil of Springhurst	4395	22.4.17	29.4.17	273	16	7,139	5·97	426·48	200	486¼
Princess Defiance of Springhurst	4392	23.4.17	30.4.17	273	20½	7,223	5·75	415·17	250	473¼
Buttercup of Springhurst	3702	28.4.17	5.5.17	273	14½	6,442	6·16	397·14	250	452¾
Princess of Springhurst	2521	29.4.17	6.5.17	273	16½	7,010	5·63	394·99	250	450¼
Verbena of Springhurst	Not yet allotted	2.5.17	9.5.17	273	13	5,545	5·40	299·31	175	341¼
Crocus of Springhurst	,,	10.5.17	17.5.17	273	15	6,295	5·56	349·92	175	399
Tulip of Springhurst	2730	11.5.17	18.5.17	273	12½	6,426	5·42	348·47	250	397¼
Wattle of Springhurst	Not yet allotted	13.5.17	20.5.17	273	16	5,768	4·98	287·37	175	327½
Holly of Springhurst	,,	24.5.17	31.5.17	273	14½	5,061	5·48	277·27	175	316
Solanum of Springhurst	4394	29.5.17	5.6.17	273	8½	7,465	4·89	364·89	200	416
Cobea of Springhurst	4379	13.6.17	20.6.17	273	7	5,512	5·60	308·56	200	351¾
Lobelia of Springhurst	4386	15.6.17	22.6.17	273	6	4,940	5·78	285·80	200	325¾
Freezia of Springhurst	4382	18.6.17	25.6.17	273	12	6,797	5·51	374·25	200	426¾

W. WOODMASON, Malvern. (Jersey.)

Completed since last report, 14. Certificated, 14.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Graceful Duchess XIV. of Melrose	Not yet allotted	31.3.17	7.4.17	273	13½	4,473	6·26	280·12	175	319¼
Jessie IX. of Melrose	3654	5.4.17	12.4.17	273	19	7,159	5·50	393·91	250	449
Empire VI. of Melrose	Not yet allotted	6.4.17	13.4.17	273	20	7,058	6·25	440·80	200	502½
Blossom IV. of Melrose	,,	16.4.17	23.4.17	273	14	6,506	5·38	350·05	200	399
Mermaid III. of Melrose*	4525	4.5.17	11.5.17	273	14	6,683	4·83	323·07	250	368¼
Vanilla IX. of Melrose	Not yet allotted	14.5.17	21.5.17	273	15	4,532	5·39	244·28	175	278½
Laura VI. of Melrose	3658	20.5.17	27.5.17	273	9½	5,527	5·30	292·69	250	333¾
Snowy III. of Melrose	3676	22.5.17	29.5.17	273	22	8,512	4·52	385·04	250	439
Mates VI. of Melrose	Not yet allotted	29.5.17	5.6.17	273	20½	7,190	5·43	390·32	175	445
Mystery VIII. of Melrose	3664	31.5.17	7.6.17	273	13	6,036	5·90	355·98	250	405¾
Pearl III. of Melrose	4526	4.6.17	11.6.17	273	14½	6,434	6·65	427·78	250	487¾
Fuchsia XI. of Melrose	Not yet allotted	12.6.17	19.6.17	273	16	5,869	5·45	319·68	200	364½
Mayflower VI. of Melrose	,,	16.6.17	23.6.17	273	13½	5,259	6·01	316·30	200	360½
Empire IV. of Melrose	3639	20.6.17	27.6.17	273	18½	7,731	5·22	403·53	250	460

* The three previous records of this cow were published under name of "Mermaid II. of Melrose."

A. H. SCHIER, Caldermeade. (Ayrshire.)

Completed since last report, 3. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	Date of Entry to Test.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
					lbs.	lbs.		lbs.	lbs.	lbs.
Dot of Pine Grove..	Not yet allotted	1.4.17	8.4.17	273	15½	7,721	4·53	349·59	250	398½
Dear of Midbranch	,,	2.5.17	9.5.17	273	14½	6,258	4·50	281·65	250	321

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Pomologist.

The Orchard.

Planting.

The time has now arrived for the general planting of deciduous fruit trees. The soil should have previously been well ploughed and subsoiled, and, as far as possible, drained. To ensure satisfactory results, it is essential that the orchard be subsoiled. Where expense is a consideration, drainage may be left for subsequent years, but once the orchard has been planted, it will be impossible to subsoil.

When planting out, the distance between the trees will be determined by the kinds to be planted. For ordinary deciduous fruiting trees it is the custom in this State to plant them 20 feet apart in the rows, the rows also being 20 feet apart. Results have proved this to be a satisfactory practice. Almond trees may be planted 15 or 16 feet apart each way, while walnuts, owing to their spreading habit, require a distance of 30 feet.

Deep planting is not advocated, the general practice being that the depth of planting in the nursery should be followed. If holes be dug, they should be shallow, the bottom being merely loosened to allow a comfortable friable bed for the tree roots. A good practice is to dig the whole strip along which the trees are to be planted, merely removing sufficient soil afterwards when planting. Another satisfactory custom is to plough furrows 20 feet apart, and to plant the trees in the furrows, filling in the soil over the roots and trampling well down.

Before planting, the roots of the young trees should be well trimmed, shaped to an even form, and cleanly cut. As the result of their removal from the nursery beds, the roots are generally more or less damaged,

and numbers of the fibrous roots, becoming dry, shrivel and die. These all require a clean trimming. Then it is often desirable to remove some of the roots so as to balance the root system. The trimming of the roots gives the young tree a clean root system, and it is enabled to establish itself with young, vigorous roots.

After planting, the top should be well cut back, so as to leave three or four arms, with three or four buds on each. Where it is not possible to have this number of arms or limbs it is frequently advisable to cut back to one stem, allowing the buds to break out strongly and frame the tree after planting. In some countries, the custom of not cutting back the trees the first year is favoured. Local experience has not resulted in favour of this practice, as it is found to be inadvisable to unduly strain the young tree by leaving a heavy top to be supported by the weak-growing root system.

A number of good commercial fruits have been found to be either wholly or partially self-sterile, requiring other varieties near them to enable them to set their fruit. For this purpose it is necessary that the bloom periods should be somewhat coincident.

Spraying.

The time has now arrived when it is necessary to spray for the following pests—scale insects, woolly aphis, and the bryobia mite. The use of red oil has been advocated for these pests, and, as well, crude petroleum, kerosene and other oil emulsions have proved satisfactory. Some years ago the use of lime, sulphur and salt spray was much in vogue as a winter spray. Owing, however, to the difficulty of preparing the spray, and to its caustic effect on the skin, it was practically abandoned as an insecticide. Even then it was claimed, and rightly so, that the spray was, to a certain extent, a very good fungicide. The use of this mixture as a winter wash, with the omission of the salt, which has been found to be an unnecessary ingredient, is now general; and, as it is obtainable in a ready-made form, it is to be strongly recommended as a good all round winter spray.

General Work.

All ploughing should now be completed; if not, it should be finished before spraying and pruning operations are proceeded with.

Any autumn manuring or liming should also be now carried out. This, too, should be finished before spraying or pruning. Before spraying with oils or with lime sulphur wash, all rough bark on apple and pear trees should be scraped off. This will mean the certain destruction of any codlin moth larvæ hiding underneath.

The Vegetable Garden.

If not previously done, asparagus beds should be well cleaned out, and a top dressing of manure given. To insure good drainage, the soil from the paths, or between the beds, may be thrown up on the beds, so

as to deepen the surface drainage, and to consequently warm the beds. This will mean earlier growths. A heavy dressing of manure should be given, and the beds well and roughly dug over.

Plant out seeds of tomatoes and the pumpkin family in the frames; and sow in the open, seeds of peas, lettuce, spinach, broad beans, radish, onions, carrot and leek. Asparagus crowns, rhubarb roots, tubers of Jerusalem artichokes, shallots and onions may now be planted out. Celery should still be earthed up, taking care not to have the beds too wet.

The Flower Garden.

General cleaning up and digging will be the work for this month in flower section and shubbery. Where the soil is heavy or sour, or where sorrel is plentiful, the garden should be given a heavy dressing of fresh lime, a fair dusting being applied all over the surface. Lime should not be used in conjunction with leaves, garden *débris*, leaf-mould, stable manure, or any other organic matter used for humus. These should be first disposed of by digging well into the soil; then shortly afterwards a top dressing of lime may be given. Should no humic material be used, the lime may be dug in with the autumn digging.

In cleaning up gardens, all light litter and foliage should be either dug in, or, better still, it should be placed in an out-of-the-way corner to form a compost heap. Leaf-mould, well rotted, is especially useful in any garden, particularly where such plants as Azaleas, Rhododendrons, Liliums, &c., are grown, or for pot plant work it is exceedingly valuable. In forming the compost heap, no medium whatever should be added to help the rotting down of the leaves unless it be a little sand. Any chemical added will render the mould unsuitable for its special objects.

Any hardy annuals may be planted out, such as stocks, pansies, wall-flowers, &c., and cuttings of roses and hardwood shrubs may also be planted. In planting out cuttings it is very important that all the eyes should be removed from the part of the cutting which is to be below the ground. If this be not done, there will always be the subsequent danger of the plant suckering.

Roses and any summer and autumn flowering shrubs that have finished flowering may be pruned. If the spring flowering shrubs have not previously been pruned, they should be allowed to remain until after the next flowering season. This especially applies to such plants as Spireas, Philadelphus (Mock Orange), Deutzia, Prunus Mume, and other early flowering shrubs. To prune these now would mean the certain loss of a great proportion of their flowers.

In pruning, the shrubs may be well thinned out, especially removing any weak upright or old flowering growths; keep the shrub always at an outward growth, inclining to a broad bushy type, instead of to an upright habit. By this means, the lower regions will always be furnished with good growth. Shrubs and trees of all descriptions should never be allowed to become too crowded; they require to be opened, so as to allow sunlight and air into the interior, where it is most needed. This is one

means by which this class of plants may be kept healthy and free from disease. Very few shrubs resent pruning, and the majority of them, including Australian shrubs, such as Acacias, are very amenable to the pruning knife.

In rose pruning, the rule is that strong growing plants require less severe cutting than the weak growing ones. As roses always flower on new wood, it is essential that the bushes be pruned regularly if good blooms are desired. All weak growths, exhausted and worn out wood must be removed, retaining only vigorous growths. It is generally advisable to always prune to four or five eyes or buds, so as to have subsequent strong growths, always pruning into the previous season's wood. Spindly growths, especially in the centres of the bushes, should be removed, the plants being trained with an open and angular habit.

To prevent loss by decay, it will be advisable to lift and store such herbaceous plants as delphiniums, perennial phlox, rudbeckias, &c., also dahlias, tubers, chrysanthemums, cannas, and perennial sunflowers and asters. Failing the possibility of doing this, they should be lifted gently with a fork, so as to allow of a slight air space under the crown.

REMINDERS FOR JULY.

LIVE STOCK.

Horses.—Those stabled and worked regularly should be fed liberally. Those doing fast or heavy work should be clipped; if not wholly, then trace high. Those not rugged on coming into the stable at night should be wiped down and in half-an-hour's time rugged or covered with bags until the coat is dry. Old horses and weaned foals should be given crushed oats. Horses at grass will greatly benefit by the addition of either hay or chaff, oats and bran. A lick, previously recommended, should be available for all horses at grass. Old and badly-conditioned horses should be given some boiled barley or linseed. Mares now approaching foaling will require careful attention, and should be kept under constant observation. It is not advisable to have mares fat at foaling time, nor is it wise to have them poor; they should, however, be kept in good working condition. The practice of working mares in shafts until they are about to foal is strongly condemned, as such a course may give rise to many foaling ailments, with consequent loss of foals, and, at times, that of mares also. Commence preparing stallion for season, especially if worked.

Cattle.—Cows, if not housed, should be rugged. Rugs should be removed and aired in the daytime when the shade temperature reaches 60 degrees. Give a ration of hay or straw, whole or chaffed, to counteract the purging effects of the young grass. Cows about to calve, if over fat, should be put into a paddock in which the feed is not too abundant. Newly-calved cows should be fed liberally to stimulate milk flow. Calves should be kept in warm, dry shed.

Pigs.—Supply plenty of bedding in warm, well-ventilated styes. Keep styes clean and dry. Store pigs should be placed in fattening styes. Sows in fine weather should be given a grass run. Young pigs over two months old should be removed from lucerne run.

SHEEP.—Go carefully through all breeding flocks on conclusion of lambing. Reserve all best-framed and profitable-fleeced ewes. Ear mark all found undesirable to breed from, and dispose of any that may be fat before prices recede in the spring. Use a neat mark for ear-marking, not the " slash," " top off," and other oversized unsightly marks. Discard all undersized, narrow-framed ewes, any with short yellow fleeces, those with thin locky staple, any with very fine, light, and wasty fleeces, ewes with "bottle" udders, single teats, undershot, overshot, or otherwise deformed mouths, ewes six years old and over. Draw teeth of aged ewes altogether, if showing open and signs of feed slipping through. Consider well before selling any early born, good-fleeced ewe lambs this coming season. Select best rams for future service; remember, wide, thick sheep are best thrivers, but they must carry good fleeces as well. Keep all ewes well crutched and the udders and eyes well cleared of wool previous to lambing. Give lambing flocks good attention.

POULTRY.—Mating of birds intended for breeding purposes should receive immediate attention. Eight second-season Leghorns or any other light breeds, or six of the heavier birds, such as Orpingtons, Plymouth Rocks, and Wyandottes (preferably in their second year), with a vigorous unrelated cockerel will be found satisfactory. Table birds bred in March or April will pay handsomely prior to the Cup Carnival. A tonic in drinking water as a preventive against chicken pox and other ailments is advantageous.

VINEYARD.—Proceed with pruning, burning off, and ploughing. Where Anthracnose (black spot) has been prevalent special care must be taken in burning off to leave no affected twigs on the ground. A double application of the acid iron sulphate swab (or spray) is advisable on vines which were badly affected; the first should be given at end of July or first week in August; the second, just before the buds burst. Complete, as early as possible, the application of manures if not already done. Mark out land for new plantations. If ground is in good order and not too wet, proceed with plantation of young vines (unpruned). Remove cuttings or scions from vines previously marked, and keep fresh by burying horizontally in almost dry sand in cool, sheltered place. Permanently stake or trellis last year's plantations.

Cellars.—Rack all young wines, whether previously racked or not. Rack older wines also. For this work choose, as much as possible, fine weather and high barometer. Fill up regularly all unfortified wines. This is a good time for bottling wine.

CULTIVATION.

FARM.—Finish sowing barley, peas and beans, and late white oats in backward districts. Trim hedges. Fallow for potatoes, maize, and other summer crops; in early districts, plant potatoes. Graze off early crops where possible.

ORCHARD.—Continue to plant deciduous fruit trees, bush fruits, and strawberries. Continue cultivating and pruning. Spray for mites, aphides, and scales.

FLOWER GARDEN.—Plant shrubs, climbers, and permanent plants, including roses; also annuals and herbaceous perennials, early Gladioli, Liliums, Iris, and similar plants. Continue digging, manuring, trenching, and liming.

VEGETABLE GARDEN.—Plant out seedlings. Sow seeds of carrots, parsnips, cauliflowers, onions, peas, broad beans, and tomatoes. Dig all vacant plots.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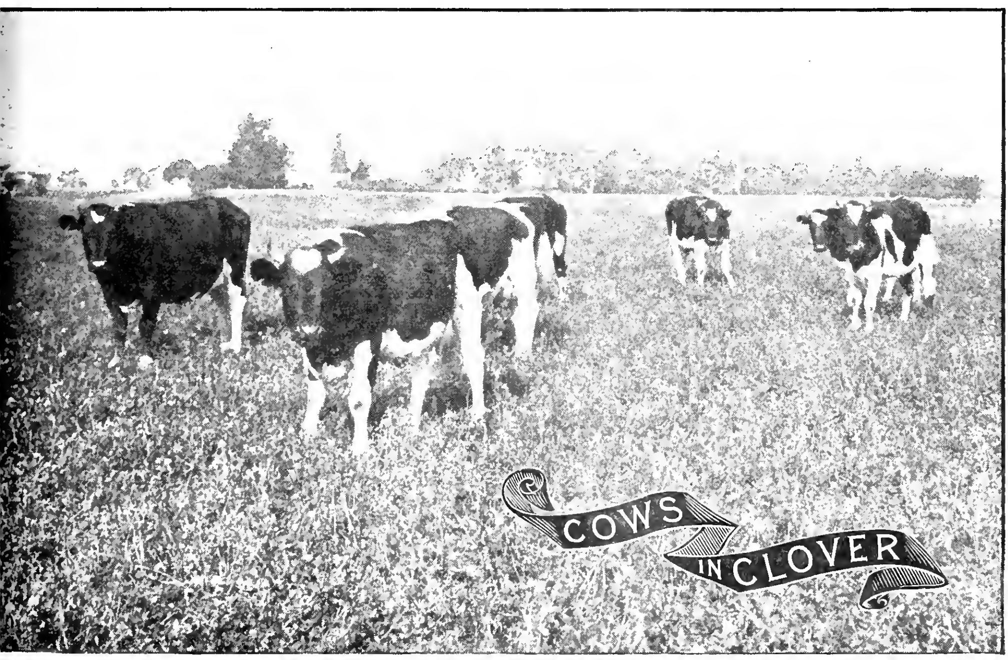

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VICTORIA, AUSTRALIA.

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THE JOURNAL

OF

The Department of Agriculture

OF

VICTORIA.

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AGRICULTURE IN AMERICA.

Letter from Mr. A. E. V. Richardson, M.A., B.Sc., to the Director of Agriculture.

[This letter contains information of a character so interesting and valuable to Victorian agriculturists that, although it is unofficial, I am taking the liberty of publishing it.—S.S.C.]

I am forwarding herewith a few notes on the progress of my investigations for the month of March. During March, I visited the States of Utah, Colorado, Kansas, and Iowa, and made a careful investigation of the work done by the Agricultural Colleges in these four States.

These States are as unlike in physical and agricultural features as four adjoining territories could well be. Utah is an arid State, with a large proportion of desert land, and a small area of intensely cultivated irrigable land.

Colorado is very mountainous, ranging from 4,000 to 14,000 feet high, and is devoted to specialized industries, such as sugar-beets, potatoes, alfalfa, tomatoes, beans, and, in addition, sheep feeding in conjunction with alfalfa raising. The climate is dry and cool.

Kansas has an elevation varying from 700 feet along the Missouri River to 4,000 feet on the boundary of Colorado. It is one of the great winter wheat States, and the centre of enormous milling and meat-packing interests. Kansas City is one of the great primary meat markets of the world. It also produces an immense quantity of maize (corn in America), and the natural concomitant of maize—hogs and beef cattle.

Iowa is the great corn State of America, and contains within its boundaries 35,500,000 acres of the richest agricultural land on the globe. Ninety-seven per cent. of the State consists of arable land, and the average value of the whole of the land of the State is probably 225-250 dollars. The soil is mostly black sandy loam, 12-18 inches in

9307.

depth, resting on a clayish subsoil. The land is gently undulating. Iowa is one of the greatest agricultural States, and is the home of corn, hogs, beef cattle, and dairying. The population is almost exclusively agricultural, and Des Moines, the capital, is the only town over 100,000 inhabitants in a population of 2,250,000. There are no "Back to the Land" problems for Iowa. Probably no other State feeds such a large proportion of its grain to hogs and cattle as Iowa. It would be a lesson for any Victorian pig or cattle breeder to come to Iowa to see how stock are fed, and he would also learn much from the way the pig and cattle breeders of Omaha send their stock to market.

Cattle and hogs are largely "self fed," *i.e.*, allowed to help themselves to corn, hay, and protein foods, such a tankage (a product of the packing industry), and cottonseed meal. Farmers realize that stock, if fed on balanced rations, may be fattened both quickly and economically. They know exactly how much corn, alfalfa, cottonseed meal, and tankage are required to produce 100 lbs. of pork or beef, and their stock are always sold at Chicago, Omaha, and Kansas City by live weight. At present, 100 lbs. of pork is selling for the same price as 14 bushels of corn, so there is a handsome profit in feeding hogs. But I must return to my subject.

Each of these four States supports an Agricultural College of academic rank, and all support them liberally with men, equipment, and money. The two eastern Colleges are bigger, better equipped, more liberally staffed, do more experimental and research work, and have much larger attendance of students than either of the western Colleges, Utah and Colorado.

Irrigation and specialized farming is the main type of agriculture in Colorado and Utah; wheat and live stock, and corn and live stock, are the dominant features of Kansas and Iowa respectively. The Colleges reflect the character of their States agriculture in the stress they give to these features in the curricula of studies.

In each State, no other agricultural institutions exist save a so-called State Board of Agriculture, the sole duty of which appears to be the holding of the annual show at the capital, and the collection of certain statistics.

The Colleges at Utah and Colorado spend, roughly, $600,000, whilst the annual appropriation of Kansas is $1,000,000, and Iowa $1,300,000. Kansas and Iowa have important courses on Animal Husbandry, and approximately half the agricultural students take the Animal Husbandry course. In all four cases, *no* farm work, such as we have at Dookie, is given. The Americans unreservedly and unhesitatingly say it is an absolute waste of time to teach a lad to plough, drill, harvest, &c. Their courses are intensely technical and practical, but the *practical* work consists of laboratory exercise, stock judging, stock feeding, &c. At Iowa, I saw a class of twenty-four students judging a group of four steers. After "scoring" them with score cards, and studying conformation, type, &c., they slaughtered them, dressed the cattle, weighed them alive and dressed, and then studied the various cuts of beef. Later, the carcasses were cut up into "round," "loin," "flank," "rib," "brisket and navel," "chunk," and "foreshank." This is the kind of practical work done by the classes in Animal Husbandry on "Beef production."

Two striking features are noticeable as compared with the work of the College of Agriculture at Berkeley—

(1) Each of the four Colleges has an important Home Economics Course of four years, leading to the degree of B.Sc., and attended by from 600 to 1,000 young women.

(2) Three of the four Agricultural Colleges have associated with it a Secondary School of Agriculture, or a non-collegiate course of three years for students who have not been able to reach the High School leaving certificate before coming to College. This "School of Agriculture," as it is termed, is really an Agricultural High School, on the same campus as the College, but controlled by an entirely separate teaching staff, though the same *equipment* is used. At Colorado there are over 300 in this High School, in addition to the 600 taking the four years' collegiate course. The grade of teaching in these secondary schools is about equal to that of Dookie, perhaps a little better; but if a student wishes to go on for the degree, he has to spend four years in the secondary school and four years in the collegiate school. At Kansas there are 407 in the secondary school, and 598 in the four-year collegiate course.

At Iowa, there are 965 students taking a four-year course in Agriculture for the degree of B.Sc., and only 213 in the secondary school.

At Colorado, I spent several days investigating sugar-beet culture, and the beet-seed industry. I had a letter of introduction to the manager of the Great Western Sugar Company, and this enabled me to see over two of the biggest factories in America, and get first-hand information regarding the raising of seed and the culture of the beets.

This company operates twelve beet factories, has a capital of $30,000,000, grows 3,000 acres of beet seed every year for its own clients, and produces 500,000,000 lbs. of granulated sugar annually. I took elaborate and detailed notes of many points of interest to the industry, and spent a day in the Longmont factory, which treated 275,000 tons of topped beet last year, and handled 3,500,000 lbs. of sugar-beet seed produced on the company's farm adjoining the factory. One of the most interesting features was a Stephan's plant, which recovers sugar from molasses. The molasses is treated with lime and water, and sugar is precipitated as saccharate of lime. This is then heated, and the saccharate breaks up into sugar and lime. This lime is used for the clarification of the juice, and the sugar is recovered in crystalline form. The company was buying molasses from other factories at $30 per ton this year, and recovering 80 per cent. of the sugar in the molasses, *i.e.*, about 40 per cent. of the total weight of molasses as sugar.

The problem of making a mechanical beet topper appears to be nearing solution. The company offered $10,000 dollars for a machine that would successfully top beets, and it has obtained many machines, which, according to the manager, promise to do the topping effectively. The company feeds 10,000 head of cattle every year. It is interesting to note that they have found that—

7,500 lbs. wet pulp, or 750 lbs. dry pulp,
700 lbs. alfalfa hay,
100 lbs. cotton-seed meal,
250 lbs. molasses,

produce 100 lbs. of beef. Beef is worth $16 a ton at present.

You might be interested to know that, at the Longmont factory, the average output of products per ton of topped beets (2,000 lbs.) was as follows:—

260 lbs.	granulated sugar.
100 lbs.	dried pulp.
35 lbs.	molasses (dry matter).
395 lbs.	

The beet has 22 per cent. of dry matter, or 440 lbs. per short ton. They now propose to recover potash from the balance. The company has been extremely successful in producing sugar-beet seed, and now has a two years' supply on hand. It not only has produced seed as good as the best German "K.W." seed, but actually has strains which give a yield, compared with standard German seed, of 114.9 (German 100), and a sugar yield of 113 per cent. I was fortunate enough to secure minute details of the processes of selection involved, as well as numerous photographs of the laboratories and apparatus used in selection of the seed.

I made some inquiries into the methods of handling stock at Kansas City and Chicago. Through a letter of introduction to Mr. Harold Swift, of Swift and Company, the great Chicago meat packers, I was able to spend two days in looking over their 20-acre plant at Chicago. I saw the hog, cattle, and sheep plant, and witnessed every operation, from the time the animals are slaughtered until the carcasses are shipped. The plant is immense. The day I visited the works, 7,000 sheep, 2,500 cattle, and 6,000 hogs were slaughtered and packed in nine hours. The stock is sold by live weight, and immediately the sales are made the animals are run over the weighbridge. No auctions are held, as in Australia. Commission agents, and the buyers from the packing houses, ride around the pens and haggle until a sale is made.

Swift and Company had a turnover of $875,000,000 last year. According to the chairman's report, the expenses of operating may be thus summarized:—

Average price paid for cattle	$84.45
Packing house and selling expenses	7.32
Net profit	1.29
Average total proceeds from carcasses and by-products	$93.06

These proceeds were divided as follows:—

Average amount per head received for beef carcasses ..	$68.97
Average amount per head received for by-products ..	24.09
	$93.06

Thus, it will be seen that the company sold beef carcasses for less than it paid for the live animals, and that the total net profit was $1.29 per head.

The Chicago Corn and Oat Pit is an interesting place. The "pit" is about 30 feet in diameter, and during the sales is crowded with brokers standing on tiers of steps yelling and signalling to one another. You would imagine you were at the finish of an exciting Cup Race at Flemington, only the noise is sustained from 9.30 to 1.30 each day. Through the courtesy of the President of the Board of Trade, I was admitted to the "floor" of the room, and became one of the surging mass of humanity in the pit. The unit of trading is 5,000 bushels, and hundreds of thousands of bushels change hands with a nod or a sign. It is a fascinating sight, but not as exciting as the scenes formerly witnessed in the "Wheat Pit." This latter has been closed since the Government fixed the price of wheat. Each broker is his own auctioneer —he merely stands in the centre of the pit and intimates he wishes to buy or sell, say, 200,000 bushels, at a price, and he is bombarded with quotations and quantities by his colleagues, and in a few seconds the corn changes hands. An officer standing on an elevated platform sends out the changes of the market every minute by means of an electrical apparatus which records the prices of corn, oats, lard, &c., in a dozen different parts of the building. Any one with a speculative spirit could satisfy his desires in a Pit at Chicago.

While at Chicago, I called at the International Harvester Company's offices, and got in touch with Professor Holden, who is in charge of the extension work of the International Harvester Company. This Extension Department does fine campaign work in the United States, and sends lecturers and agents out all over America to do what a State Department of Agriculture does in Australia. Dr. Holden is a live wire, and has an army of specialists and lecturers to help in improving agricultural practice by means of bulletins, lectures, farmers' institutes, experimental plots, the whole cost of which is borne by the Harvester Company.

I append a few notes regarding the Colleges at Kansas and Iowa. Both of these Colleges have been very successful, and are remarkably well supported by the farmers and by the State. They have made remarkable progress during the past ten years. The development has arisen from the necessity for more intensive direction of the agricultural industries. There has come to the community a recognition that the land must be better worked and live stock more efficiently handled in order to secure the highest returns from the rich soil of the middle west. Land values increased considerably, and, with the rise in land values, a system of live-stock farming and feeding, which had to adjust itself to the newer range of values, became imperative. The Kansas and Iowa Colleges seem to be regarded by the farmers as a kind of Mecca to which they may go to have their problems solved. When farmers' courses are advertised, the farmers attend in thousands. Most of the young men at these Colleges come from the land. Approximately, half the graduates go back to the land after graduation.

At both Colleges, the Animal Husbandry courses are particularly strong. A fortnight ago, several hundred cattle breeders spent a week at Iowa investigating the experimental feeding results of the Animal Husbandry Department.

KANSAS AGRICULTURAL COLLEGE.

Organization.—The organization comprises:—

(1) *A Board of Control.*—Three members, appointed by the Governor, with the Governor *ex officio* Chairman. This Board elects a business manager, who controls all purchases. The Board chooses—

(2) *A President,* and appoints, on the recommendation of the President, all employees, and fixes the stipends. The President has absolute control of the internal administration of the College, but the Board exercises a financial control, and can, to a large measure, determine the policy of the institution.

(3) *The College* is organized in three divisions—

(1) College of Agriculture and Mechanic Arts.
(2) Agricultural Experiment Station.
(3) Division of Extension.

The College of Agriculture and Mechanic Arts is divided into five Departments:—(1) Agriculture; (2) Mechanic Arts; (3) General Science; (4) Veterinary Science; (5) Home Economics. Four-year courses are given in each of these, leading to the degree of B.Sc. In addition, there is a School of Agriculture of secondary grade, with a three-years' course, which is a preparatory school for the four-year College course.

The Extension Division consists of eight departments:—(1) County Agents; (2) Institutes and Extension Schools; (3) Boys' and Girls' Clubs; (4) Home Economics Agents; (5) Rural Engineering; (6) Home Demonstration Agent Work; (7) Rural Organization; (8) Home Study and Service Department (Correspondence).

The Experiment Station is divided into:—Agronomy, Animal Husbandry, Dairy Husbandry, Horticulture, Milling Industry, Poultry Husbandry, Veterinary Medicine, and Engineering Departments, each with a chief and a staff of investigators.

(4) *Equipment.*—The equipment and buildings of Kansas Agricultural College are most elaborate. The value of the equipment at Kansas was estimated at $2,000,000, made up principally of:—

Buildings	$972,324
Apparatus, equipment, &c.	$707,452
Value of campus and farm	$261,500
Endowment funds	$491,746

Staff.—The Staff of the College consists of a total of 414, viz.:—A President; 5 Deans; 31 Professors; 51 Associate Professors; 185 instructors. In addition, there is an Extension Staff of 135 graduates, of which 8 are heads of departments; 56 county agents; 27 specialists in Agriculture; 15 assistant county agents; 7 club-work agents; and 18 are women demonstrators.

Students.—The students enrolled in 1916-17 were:—

Agriculture (for four years' course B.Sc.) ..	598
Agriculture (Secondary School, three years' course)	422
Home Economics (women)	643
General Science	311
Mechanic Arts	171
Civil, Mechanical, and Electrical Engineering ..	146
Veterinary Science	91
Others	104
	2,466
Farmers' Short Courses, Traction Engine Courses, and Summer School	873
Total	3,339

Now, these attendance figures should be compared with Dookie, Longerenong, and the University, to obtain a contrast between the success obtained in teaching Agriculture in Kansas with that obtained in Victoria. It is interesting to note that the area of Kansas is almost exactly equal to that of Victoria, and the population almost the same, 1,650,000 (1915 figures). The area of Kansas is 53,000,000 acres. The total agricultural and live stock production for Kansas was, however, \$371,000,000 last year, as compared with \$190,000,000 for Victoria in 1917.

I cannot hope to describe the details of the courses and work done at these institutions. The catalogue and literature forwarded last mail will enable you to get an idea of the work carried on by the institution. You may be interested to know that, at the time of my visit, there were 40 horses, 230 cattle, 320 pigs, and 350 sheep on the farm. A large number of investigations in feeding steers, cattle, dairy cows, and hogs were in progress. Among the milking cattle were the following cows:—

Melrose Canary Bell (Ayrshire).—13,000 lbs. milk, 505 lbs. of butter-fat, at two years old.

The Owl's Design (Jersey).—14,600 lbs. milk, 650 lbs. fat.

Maid Henry Pontroy (Holstein).—14,000 lbs. milk, and 519 lbs. fat. 28 lbs. butter in seven days, official test.

Eighty-three cows were being milked. The average production of the herd was over 900 gallons (9,000 lbs. milk), and the average of butter-fat just exceeded 400 lbs. The standard ration is alfalfa, hay, and corn silage. For concentrates, 4 parts corn, 2 parts bran, 1 part cotton-seed meal, was mixed, and 1 lb. of mixture given for every 4 lbs. of milk given by Guernseys and Holsteins, and for every 3 lbs. of milk given by Jerseys and Ayrshires.

IOWA STATE COLLEGE OF AGRICULTURE.

The State of Iowa is even smaller than Kansas, but it is far more fertile and productive. Of the 35,000,000 acres in the State, 97 per cent. is arable, and over 10,000,000 acres is sown to corn. The annual production of maize exceeds 300,000,000 bushels. The best farmers practise a rotation of corn, oats, clover or corn; corn, oats, clover.

Iowa is about two-thirds the size of Victoria. It spends $1,350,000 on the Agricultural College.

The College is at Ames, some 35 miles from Des Moines, the capital.

Like Kansas, the College is controlled by a Board of eleven, with President, Secretary, and nine members, three of whom are appointed annually. The College has the same general plan of organization as Kansas:—President, with the (1) College of Agriculture and Mechanic Arts; (2) Agricultural Experiment Station; (3) Division of Extension.

(1) *The College of Agriculture* is divided into the following divisions:—(1) Division of Agriculture; (2) Engineering; (3) Veterinary Science; (4) Industrial Science; (5) Home Economics. Each division is in charge of a Dean.

(2) *The Experiment Station* consists of the following departments:—(*a*) Agronomy; (*b*) Agricultural Engineering; (*c*) Animal Husbandry; (*d*) Bacteriology; (*e*) Botany; (*f*) Chemistry; (*g*) Dairy; (*h*) Entomology; (*i*) Farm Management; and (*j*) Horticulture.

(3) *The Extension Division* is growing rapidly. It has the same general organization as Kansas and Iowa, and now has a county agent in each county of the State—98 in all. The extension work is inspiring.

Expenditure.—

I. (1) College of Agriculture and Mechanic Arts ..	$675,000
(2) Secondary School of Agriculture ..	55,000
II. Extension Department	350,000
III. Experiment Station	150,000
	$1,230,000

Staff.—57 Professors; 57 Associate Professors; 196 assistants and instructors.

Students.—

Collegiate	2,562
Non-Collegiate (Secondary School) ..	353
	2,915
Summer School	683
	3,598
Winter Short Courses	3,871
Total	7,469

Summary of Students.—

Collegiate Grade—		
1. Agriculture (Collegiate)—		
Graduate (for M.S.A.)	115	
Fourth year B.S.A.	175	
Third year B.S.A.	192	
Second year B.S.A.	220	
First year B.S.A.	378	
	1,080	
2. Engineering (Collegiate)	746	
3. Home Economics (Collegiate)	552	
4. Industrial Science (Collegiate)	118	
5. Veterinary Medicine (Collegiate)	133	
	2,629	
Less duplicates	67	
		2,562
Non-Collegiate—		
Agriculture	213	
Engineering	61	
Home Economics	52	
Music	96	
	422	
Less duplicates	69	
		353
Summer School		683
Winter School—Short Course—		
Agriculture	2,469	
Engineering	1,026	
Home Economics	383	
Veterinary	184	
	4,062	
Less duplicates	191	
		3,871
Grand Total of all Students		7,469

Experimental Work.—The experimental and research work at this station is particularly fine. My notes on them extend to over 60 pages. I must now content myself with a brief summary of some of the practical results achieved.

1. Two new oats, Iowa 103, and Iowa 105, were distributed among Iowa farmers. It is estimated that the increased production resulting from these varieties has increased Iowan production by 5 bushels per acre.

2. A new Machine.—The Ames scarifying machine, for scarifying the hard coat of sweet clover seed, was developed at the College. It is

now in use in forty commercial clover seed houses, and by its use farmers have secured better stands from 5 lbs. scarified clover seed than 20 lbs. of unscarified seed per acre.

3. A new winter wheat has been originated which has increased production considerably. Its chief quality is that it does not winter kill like most of the winter wheats of the northern corn belt.

4. The thorough soil surveys of the State have been extremely useful to farmers, and there is now a soil map, which shows the location and extent of each soil type in the county, which is the real basis of all work dealing with the soil-management problems of the county.

5. Two-year old steers will make a maximum profit on heavy feed of cheaply-produced silage, with about one-fourth to one-half of a regular full ration of high-priced corn.

6. It has been demonstrated that self-fed fattening swine should return as high as a dollar a head more profit than when handled in the ordinary hand-fed manner. With the 10,000,000 hogs that are annually marketed from Iowa, this means an increased earning of millions of dollars.

7. The free-choice system of swine feeding, wherein the pig helps himself to such feeds as corn, tankage, alfalfa, pasture, &c., has proved so successful that the hog industry is being revolutionized. The scheme saves labour, and economizes feeding. This free-choice system originated at the Iowa Station, and is now practised in every State in the Union.

8. Bulletin No. 165, copy of which has been forwarded, shows the results of eight years' work in determining the influence of environment and breeding in increasing dairy production. This is the first data published showing the influence of the pure-bred sire, independent of improved methods of feeding and management. In increasing the production from scrub or common cows, the value of the pure-bred sire as a factor in increasing the production of farm herds is closely demonstrated, as many of the heifers by a high-grade, pure-bred dairy sire have produced 50 per cent. more butter-fat, and 75 per cent. more milk than their scrub dams.

9. Experiments in Capon production, show that the larger breeds of poultry can be profitably caponized. Capons, compared with cockerels of the same age and breeding, and reared under the same conditions, produce a net increase of 25 per cent. to 40 per cent. above that received for cockerels.

10. Ear corn, preferably broken, for fattening lambs is the most practical single form in which this grain can be fed. For profitable fattening, corn need be neither shelled nor ground, unless it be towards the end of a prolonged fattening period.

11. The allelomorphism of horned and polled characters in cattle has been demonstrated, and tests conducted over a period of ten years show that breeders of polled cattle may introduce superior horned animals into breeding herds without danger of seriously losing ground.

12. Comprehensive tests have been made to show the efficiency of corn, alfalfa hay, barley, oats, gluten feed, tankage, cotton-seed meal, linseed meal, singly, and in various combinations with roughages found on the average Iowa farm, when fed to dairy cattle, beef cattle, and hogs. The results have been published in various bulletins issued by the Station.

13. In addition, studies have been made of farm management problems in Iowa, marketing problems, pruning and spraying of fruit trees, production of red clover and alfalfa seed, organisms responsible for the preservation and fermentation of silage, crown gall of apples, fusarium in corn, canker in apples. The results are summarized in bulletins.

14. Experiments are in progress for the wintering of pregnant sows and ewes, dry-lot rations for swine, feeding of sows with litters, heredity experiments with swine. I have secured progress reports of these.

15. Investigations are being made of the effect of calcium, protein, and phosphorus fed pregnant swine, and sheep on the size, vigour, bone, and condition of the offspring, and the maintenance requirements of lean and fat cows.

The State College of Iowa has reason to be proud of its achievements and its work. It has done much to raise the standard of agriculture in the corn belt, and the farmers and politicians of Iowa liberally support the institution. 965 students, the majority farm lads, are taking a four-year course in Agriculture for the degree. 115 graduates are securing a two-years' extra training for higher degrees. 213 lads are taking the non-collegiate course in Agriculture because they could not reach the standard for entrance to the College. 2,469, mostly farmers, availed themselves of short courses of one to two months during the winter. 683 took the summer school courses in Agriculture. So you will see that a total of 4,232 received instruction in Agriculture at the College last year. This for a population of 2,250,000 people.

The Extension Staff, with the aid of 98 county agents, are now being employed to carry the teaching and message of the College to the farmer's back door. Do you remember, three years ago, Mr. Hughes speaking at the University, and stating that he intended to create an organization, the object of which would be to carry a steady flow of scientific knowledge past every citizen's house, so that any one thirsting for knowledge might be able to dip his pannikin in the stream as it flowed by his back door? Well, Iowa has an organization like that. It first, through its Experiment Station, delved for the truth, studied the relation between cause and effect in agricultural phenomena in the corn belt, and gradually accumulated a mass of information of the highest potential value for the producers. Simultaneously, it began to teach what truths it had found, together with the knowledge accumulated at other centres. After several decades of waiting for recognition and appreciation, the College has now come into its own. It is crowded with students, and finds itself compelled to create an organization—the Extension Department—to carry the truths and the lessons to every farmer's back door. It is a vitalizing, life-giving stream of knowledge that flows from Iowa, because it arises from the fount of experience and systematic experimentation. It is definite, systematic knowledge, technical, scientific, bearing on every-day problems, and the farmers appreciate it, for every county has its county agent, and no county agent is appointed unless the local authorities pay his expenses, including travelling, automobile, stenographer's, and office expenses. Moreover, the farmers are required to pay regular dues towards the expenses of operating the Farm Bureaux.

I had the good fortune to meet Mr. Wallace, of the *Wallace Farmer*—one of the leading papers of the Corn Belt—Mr. Sanders, editor and proprietor of the *Breeders' Gazette;* Mr. Chrissy, of the *Country Gentleman* and *Saturday Evening Post.* All these authorities speak in most flattering terms of the men and of the work done by the Universities and Colleges in the Middle West.

There is no doubt that the Schools of Agriculture, the Universities, and the Agricultural Colleges stand high in the opinion of business men, commercial men, breeders of stock, farmers, and the press. "Forty years of comparative failure and twelve years of dazzling success," is Dr. True's epitome of the history of the American Colleges. Are we condemned to spend forty years of travail in Victoria before we may expect a like success? Not if our legislators and people will have faith in the ultimate triumph of scientific agricultural education and provide the men, money, and equipment necessary to put agricultural education on a sound basis.

THE BABCOCK TESTER ON THE FARM.*

By R. T. Archer, Senior Dairy Inspector.

According to the evidence given before the Inter-State Commission, our dairy farmers are in a parlous plight. The average return per cow was stated to be about 140 lbs. of butter fat. Valuing this at 1s. per lb. a return of £7 per cow is arrived at. This amount of butter fat would be obtained from 350 gallons of milk, so there would be about 315 gallons of skim milk; at 1d. per gallon this would give the cow an additional credit of 26s., making a total of £8 6s.

The cost of keeping such a cow for a year is about £9. This covers all expenses; so that on an average there is a loss of about 14s. per cow. On the other hand, we know of very many dairy farmers who are making handsome profits, consequently there must be many who are losing more than 14s. per cow. That is where the drudgery and hardship come in. We know that the dairying industry saved this country from bankruptcy. We also know that it is the surest way for a farmer with limited capital to make a living.

Those farmers who are producing an average of 300 lbs. of butter fat per cow are doing so at very little more expenditure than those who are keeping inferior herds, the additional cost consisting of interest on increased value of cows and cost of concentrates (*i.e.*, bran. oats, &c.) fed. This additional cost does not amount to more than £5 per cow and, in many instances, not half that. A 300-lb. of fat cow would yield about £3 worth of skim milk, leaving the cost of production about £11.

What is the remedy for the above poor results?

FEED—TEST—CULL.

Use a pure-bred bull from a cow proved by scales and test to be a producer of a large quantity of milk and butter fat.

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* Reprinted with additions from the *Journal of the Department of Agriculture* for July, 1911.

Feed is placed first, because many cows, now unprofitable, would give good results if provided with a sufficiency of suitable food. Cows that have not inherited a capacity for converting food into milk containing a large quantity of butter fat can never be made profitable dairy cows. These will be discovered by the Babcock Test and can be fattened for the butcher.

To test all the cows in the principal dairying districts in Victoria would cost about £40,000 a year, but it would be the means of increasing the average return per cow in a very short time by 40 lbs. of butter fat per head. This alone would increase the receipts of the dairymen by £1,200,000 per year. During the last drought about 200,000 cows were lost—died of starvation. At £10 per head, this meant a loss to the State of £2,000,000. One acre, per cow, of grass mown and made into hay or ensilage each year would be an insurance against drought.

Below will be seen the result of using a pure-bred bull with the capacity to produce heifers capable of giving large returns of milk and butter fat. Note the consistently high percentage.

It would be well for dairy farmers if it were made compulsory that only pure-bred bulls from tested cows should be used in dairy herds.

Results of the Herd Test.

The following are some of the results of the operations of the Standard Herd Test conducted by the Department of Agriculture. Included are heifers on their first calf which, of course, pull down the average. In some it will be seen that there has been an increase of 50 lbs. per cow, and over 100 gallons of milk in three years. This is partly due to culling out inferior cows, but more particularly to more rational methods of feeding. It is proved beyond doubt that if cows are properly fed they will give a greater net profit:—

Year.	No. 1 Herd. Average Yield.		No. 2 Herd. Average Yield.		No. 3 Herd. Average Yield.		No. 4 Herd. Average Yield.		No. 5 Herd. Average Yield.	
	Butter Fat.	Milk.	Butter Fat.	Milk.	Butter Fat.	Milk.	Butter Fat.	Milk.	Butter Fat.	Milk.
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
1913 ..	309	6347	264	4982	..	..	..	..	..	..
1914 ..	332	6671	288	5281	341	6148	..	..	..	..
1915 ..	360	7211	261	4771	337	6021	337	5854	251	4706
1916 ..	355	7415	261	5137	348	6345	382	6733	272	5254
1917 ..	355	7139	297	5484	339	6152	402	7527	303	5720

There are about 600,000 dairy cows in Victoria. If the average butter fat yield were raised only 20 lbs. per head, it would increase the returns to the Victorian farmers by £600,000.

If 140 lbs. fat costs £8 6s. to produce, that is 1s. 2d. per lb.

If 300 lbs. fat costs £11 to produce, that is 8¾d. per lb.

One herd in Gippsland averaged £27 per cow last year for cream sent to a butter factory, leaving a clear profit of £16 per cow. This was the result of well-bred cows properly fed.

The benefit of using a good bull is shown in the following table of—

PRETTY NOBLE'S DAUGHTERS.

Name.		Milk.	Test.	Butter Fat.	Weight of Milk on 273rd day
		lbs.		lbs.	lbs.
Lassie Fowler	1st calf	5,977	5·69	340	15½
	2nd ,,	7,843	5·43	425	22
Empire V. of Melrose	1st ,,	5,661	5·42	307	15
	2nd ,,	6,696	5·22	353	14½
Chevy VIII. of Melrose	1st ,,	6,011	5·63	338	19
	2nd ,,	5,686	6·05	344	20
Jessie XIII.	1st ,,	5,261	6·21	327	13½
	2nd ,,	6,299	6·38	401	13½
Creambread	1st ,,	5,203	5·97	310	15
	2nd ,,	5,700	6·17	351	13
Jessie XII. of Melrose	1st ,,	5,063	5·99	303	18
	2nd ,,	6,396	5·95	374	13
Graceful Duchess XI. of Melrose	1st ,,	4,470	6·02	269	14½
	2nd ,,	6,798	6·07	412	17
Jennie Lind	1st ,,	5,714	6·07	347	13
Laura, 16 ..	1st ,,	5,394	6·37	343	14
Jessie, 485	1st ,,	5,692	5·98	340	14
Blossom IV. of Melrose	1st ,,	5,678	5·79	328	16
Vanilla VII.	1st ,,	5,315	5·9	313	..
Handsome Girl VIII. of Melrose	1st ,,	4,971	6·13	304	15
and many more.					

The following figures, which were obtained by actual daily weighing and monthly tests, will serve to illustrate the results of management and the value of keeping exact records:—

NO. 1 HERD.

Cow No.	Milk.	Average Test.	Butter Fat.	Milk last day of test.	Value of Butter Fat at 1s. per lb.
	lbs.		lbs.	lbs.	£ s. d.
1	5,635½	4·85	273·68	10	13 13 8½
2	6,148	4·09	253·05	5	12 13 0½
3	4,473½	4·98	222·99	4	11 2 11½
4	3,790½	4·93	186·82	24½	9 6 9¾
5	3,228½	5·26	169·92	16½	8 9 11
6	3,683½	4·58	168·70	18½	8 8 8
7	3,421	4·58	156·75	6½	7 16 9
8	2,613½	5·90	154·11	4	7 14 1
9	3,281½	4·30	141·07	23	7 1 0¾
10	3,776½	3·20	124·38	..	6 4 4½
11	1,808½	5·00	90·52	4	4 10 6
12	1,464½	5·90	86·74	4½	4 6 9
13	1,863½	4·30	80·10	4	4 0 0
14	1,254½	5·68	71·32	4½	3 11 4
15	1,162½	6·02	70·05	4	3 10 0
Average per cow ..	3,173½	..	150·00	..	7 10 0
	Plus skim milk, 285 gals. at 1d. ..			.. ..	1 3 9
					8 13 0

Had these cows calved mostly in the autumn and been better fed the results would have been better, but curiously enough they really approximate to the average result for the whole of Victoria. The average test of this herd was higher, but the butter fat and money returns were about the same. The first cow, allowing £2 2s. as the value of her skim milk, would have given a net profit of £6 15s. Her 273 lbs. of butter fat cost under 8d. per lb. to produce. No. 15 cow, allowing 8s. 8d. for her skim milk, showed a loss of £5 1s. 4d.; her 71 lbs. of butter fat cost 2s. 6d. per lb. to produce.

NO. 2 HERD.

Cow No.	Milk.	Average Test.	Butter Fat.	Milk last day of test.	Value of Butter Fat at 1s. per lb.
	lbs.		lbs.	lbs.	£ s. d.
1	11,427	4·58	523·60	24½	26 3 7
2	9,385	4·79	450·45	28½	22 10 5
3	8,266	5·16	426·31	26½	21 6 3
4	9,813	4·34	426·17	28½	21 6 2
5	7,586	5·39	409·18	21½	20 9 2
6	8,043	5·03	404·31	15	20 4 3
7	7,364	5·37	395·43	18	19 15 5
8	7,491	5·24	392·85	13½	19 12 10
9	7,598	5·14	390·59	18	19 10 7
10	7,902	4·98	394·08	20	19 14 1
11	6,835	5·57	380·82	18	19 0 9
12	7,161	5·26	377·04	10	18 17 0
13	6,680	5·56	372·09	14	18 12 1
14	7,808	4·55	355·73	19½	17 15 9
15	5,786	6·07	351·06	20	17 11 0
16	7,347	4·67	343·29	17	17 3 3
17	7,400	4·62	341·68	16	17 1 8
18	6,959	4·86	338·27	16½	16 18 3
19	7,823	4·31	337·03	15	16 17 0
20	7,155	4·43	317·11	15	15 17 1
21	5,766	6·05	349·19	15½	17 9 2
22	5,909	5·31	313·78	14	15 13 9
23	4,760	6·56	312·20	11½	15 12 2
24	5,636	5·4	305·18	15	15 5 2
25	5,342	5·63	300·95	13½	15 0 11
26	6,067	4·95	300·14	21½	15 0 1
27	5,086	5·81	298·56	14½	14 18 6
28	6,097	4·70	286·53	18½	14 6 6
29	5,515	5·12	282·40	18½	14 2 4
30	5,717	4·89	279·56	12	13 19 6
31	5,281	4·99	263·78	8½	13 3 9
	217,005	..	10919·36	..	550 18 6
Average ..	7,000	5·03	352·23	..	17 12 3

Now look at No. 2 herd. This consisted of 31 pedigree Jersey cows, including first-calf heifers. Its average was 7,000 lbs. of milk, containing 352¾ lbs. butter fat which, at 1s. per lb., equals £17 12s. 3d.; 630 gallons skim milk, which at 1d. per gallon, equals £2 12s. 6d. Allowing £11 per cow the butter fat from this herd cost 7½d. per lb. to produce.

As 3 gallons of skim milk will produce 1 lb. of pork, worth, say, 6d. per lb., the value of the skim milk from each cow may be set down at £5 5s. Consequently, there would have been a net profit of £11 17s. 3d., to say nothing of the increased value of the calves from such a herd. As a matter of fact, the milk from No. 2 herd was sold wholesale at 1s. per gallon, and thus the return from each cow amounted to £35.

A remarkable fact of this herd is the quantity of milk which it yielded on the 273rd day of the test, for the majority of the cows were due to calve again within twelve months of their previous calving. No. 1 cow of the herd was, at the time of the test, in her eighteenth year, and is now (March, 1918) twenty years old, and still "going strong."

HOW TO USE THE BABCOCK TESTER.

Sufficient has been written to prove the necessity for the farmer being able to use the Babcock tester, as well as to test cream and separator milk, so that he may be able to ascertain whether or not it pays to feed and milk the individual cows in his herd. The object of this article is to explain the correct method of working this invaluable appliance.

To insure satisfactory results it is necessary that a correct sample be obtained—a sample that represents correctly the composition of the bulk. The method of sampling milk generally adopted in butter or cheese factories is what is known as the drip system, in which the milk runs along a chute from the weighing tank to the vat. A hole is punched in the bottom of the chute through which the milk drips while it is running along the chute. A vessel is placed to catch the drip and a small quantity is put into a bottle. This is repeated with each delivery. A little formalin is dropped in with the first lot to preserve the sample until the end of the week when it is tested.

TESTING COWS.

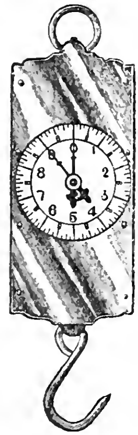
Taking the sample.—Strip the cow thoroughly dry. Weigh the milk on the scales (Fig. 2), which should be hanging in a convenient place, and note the weight on the ruled sheet* (Fig. 3). Pour the milk from one bucket to another three times, and immediately take 1 c.c. (cubic centimetre) for every pound of milk, and place it in the sample bottle; *i.e.,* if there are 25 lbs. of milk, take 25 c.c. into the sample bottle. Put into this three drops of formalin (40 per cent. solution) and mix by giving a gentle rotary shake. Repeat this for six consecutive milkings, except that no further formalin is required, the three drops added on the first occasion being sufficient to keep the sample sweet until it is convenient to make the test. As each fresh lot of milk is added, the quantity in the bottle should be mixed by shaking with a gentle rotary motion. The sample, which should be kept tightly corked, should not be shaken violently at any time or the cream may be churned, and this would make the testing difficult.

Making the test.—When the milk has stood for a few days, the cream will have risen to the surface and become tough and leathery, and will

* Record sheets may be obtained from the Department of Agriculture, Melbourne. When ordering, applicants should state whether the weekly or monthly sheets are required, and whether for cabinet or not. Ordinary sheets are on sale at 1s. per dozen (post free); those for cabinet at 2s.

not mix thoroughly by shaking, until it is heated. Stand the sample bottle in water, of a temperature from 100 to 110 degrees Fah., until the cream is softened; then agitate gently until it is thoroughly mixed with the milk, no small lumps remaining. The milk must then be cooled to between 60 and 70 degrees Fah., which is the correct temperature at which to mix the milk and acid in the flask, both being as nearly as possible at the same temperature.

1.—Six-bottle Babcock Tester.



2.—Milk Scales.

Now take 17.6 c.c. milk, giving the sample a shake first, and run this into the flask; to this add 17.5 c.c. sulphuric acid. When running in the milk and acid, hold the flask in a slanting position and allow the liquid to run gently down the inside of the neck. Shake the flask with a rotary motion until all the curd (casein) is dissolved. Place the flasks in the machine so that they balance and rotate for five minutes at the speed indicated on the machine. Fill up to the bottom of the neck with boiling water, run for two minutes more, fill to within $\frac{3}{4}$ inch of the top of the neck with more boiling water, run for one minute, take the flasks out of the machine and stand in a water bath (Fig. 4 K) at 140 degrees Fah. for a few minutes. Then read off the tests. The butter fat should now be separated and collected in a clear compact column, like olive oil, in the neck of the flask on top of the water.

Reading the test.—By the illustration (Fig. 5) it will be clearly seen how the flasks are graduated. Each division marked by long lines and numbered, represents one per cent., and each division between marked by

short lines equals .2 or two-tenths of one per cent. It will be easy to measure to one-tenth of one per cent., or half one of the small divisions.

MONTHLY CHART.

For the guidance of Dairymen in recording each Cow's Milk.

NAMES OF COWS.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
DATE	LBS MILK	LBS MILK	LBS MILK	LBS MILK	LBS MILK	LBS MILK	LBS MILK	LBS MILK	LBS MILK	LBS MILK	LBS MILK	LBS MILK	LBS MILK	LBS MILK	LBS MILK	LBS MILK	LBS MILK	LBS MILK	LBS MILK	LBS MILK	LBS MILK	LBS MILK	LBS MILK	LBS MILK
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TOTAL																								
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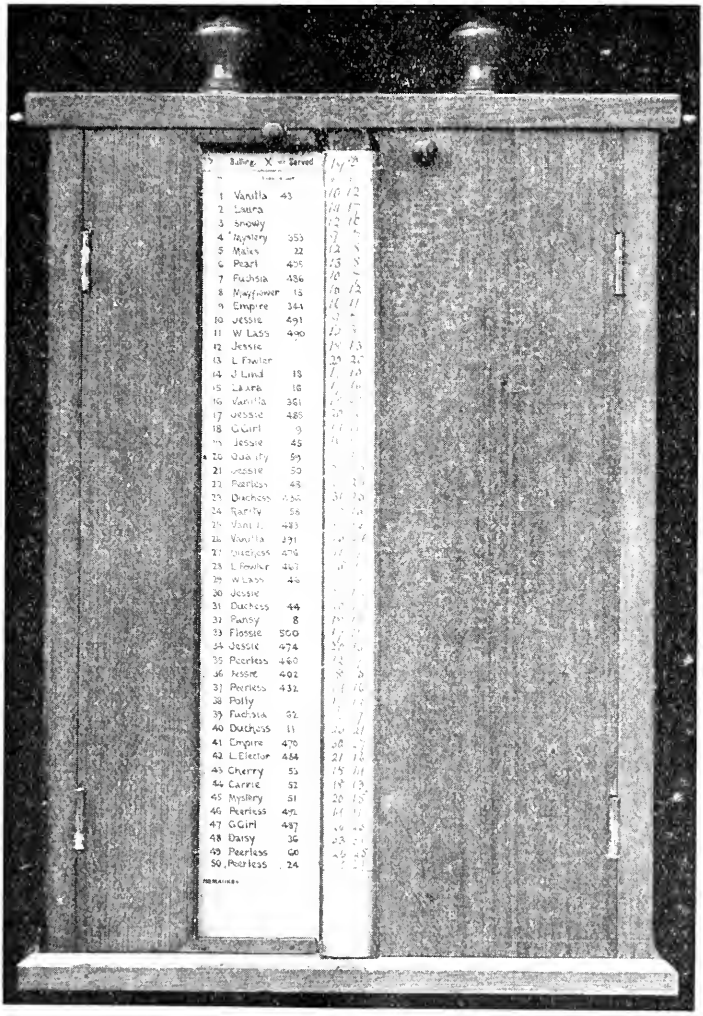
2ND "																								
3RD "																								
4TH "																								
AVERAGE																								

3.—**Ruled Sheet for Milk Records.**

With the compass (Fig. 4 E) the full length of the fat column is taken where the fat comes in contact with the glass (Fig. 8).

It will be noticed that while the bottom of the fat column is straight and distinct the top shows a meniscus or hollow, and one may be in doubt how to take the measure. This should be the full length of the column where the fat is in contact with the glass, or, as is shown in the illustration, measure from *a* to *b*—not to *c* or *d*. Measure the fat column with

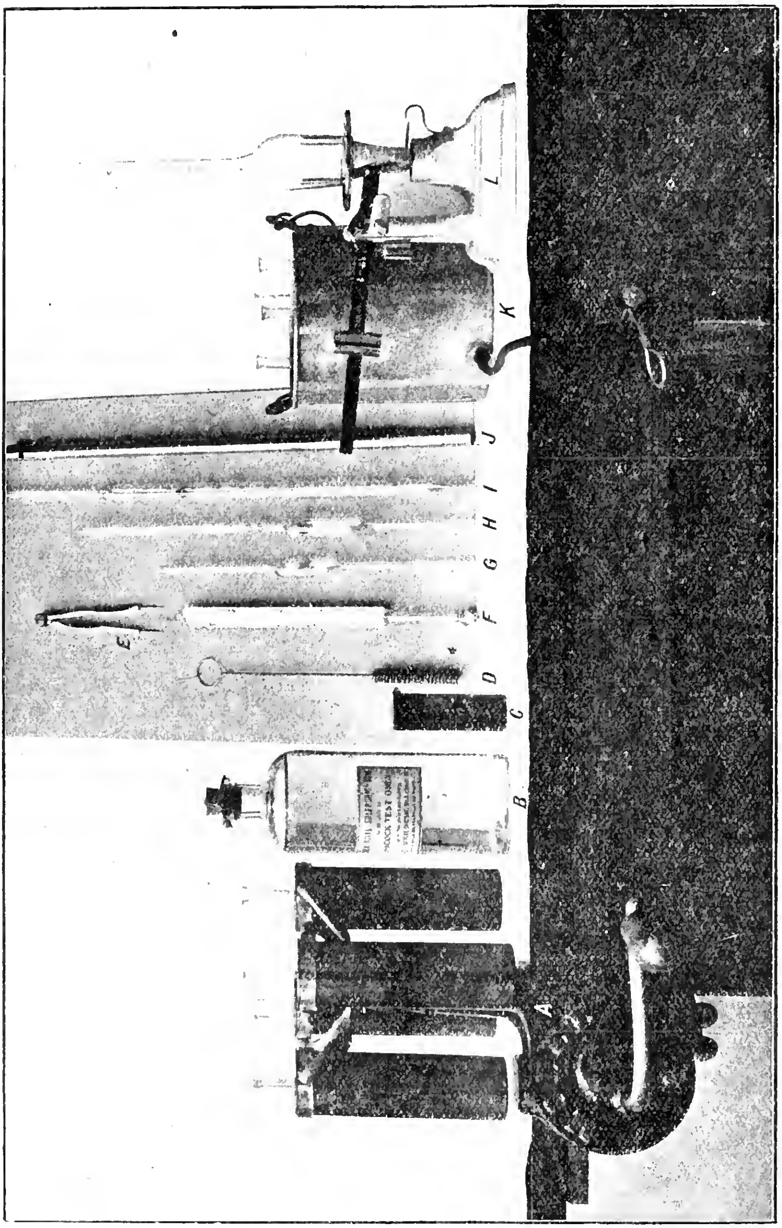


3a.—Cabinet for Chart.

the compass; place one point on the zero and see how far the other point reaches. This will show how many spaces the fat fills, and the reading gives the correct percentage of fat in the milk.

Calculating the result.—The weight of the milk given by the cow, multiplied by the test and divided by one hundred, gives the amount of

butter fat in pounds. To convert this approximately into commercial butter, one-sixth is added to the fat result.



4.—Farmer's Testing Outfit.

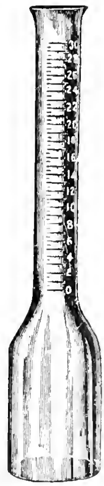
A, Four-bottle Babcock Tester; B, Sulphuric acid; C, Acid measure; D, Brush for cleaning flasks; E, Compass; F, Thermometer; G, 8.8 c.c. pipette; H, 17.6 c.c. pipette; I, 50 c.c. pipette; J, Milk thief; K, Hot water bath; L, Cream scales.

Example.—35 lbs. of milk at 4.2 test = $35 \times 4.2 \div 100 = 1.47$ lb. butter fat + $\frac{1}{6}$ = 1.715 lbs. (practically $1\frac{3}{4}$ lbs.) commercial butter.

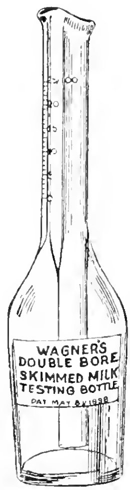
Sulphuric acid.—The sulphuric acid should be of a definite strength, *i.e.,* 1.827 specific gravity, and it is usually supplied by the agents at this strength. Care must be taken in handling it as it is very corrosive. The appearance of the fat, when the test is completed, will indicate if the acid is of the correct strength. Instead of being a clear amber-coloured column it may have black or white specks mixed through it. Black specks may be caused by the temperature of the milk or the acid being too high when mixed, or by the use of too much acid, or an acid of too high a strength.

It will be easy to discover in this way if the acid is too strong. If so, use one or two c.c. less; if the fat comes out clearly, the result will be correct. On the other hand there may be white specks of undissolved curd in the fat column. This may be due to temperature

5.—Milk Test Bottle.



6.—Cream Test Bottle.



7.—Skim Milk Bottle.

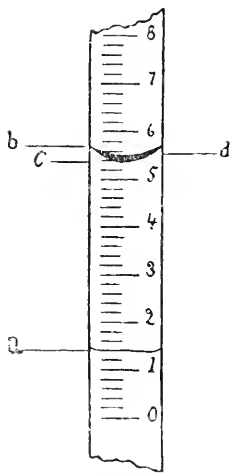
of the milk or the acid being too low when mixed, too little acid being used, or to the sample not having been shaken sufficiently at time of mixing to dissolve all the casein. The specks will be particularly noticeable if too much formalin has been used in the sample, or if the acid is too weak. If not much too weak, one or two c.c. more acid may bring the test out clearly, when the results should be correct. If the stopper is left out of the bottle the acid will absorb moisture from the air and so become weaker. The acid should be water white, but sometimes, through dust getting in or through other reasons, it turns dark; if a clear reading of the fat is obtained, it is evident that the acid is of the right strength. Do not dilute by adding water. Very serious accidents have frequently occurred by this being done.

Specimen forms for keeping a record of both individual cows and that of the whole herd are shown on pages 408-9.

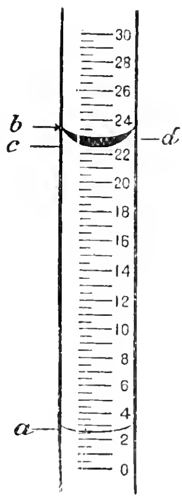
Testing Cream.

Sampling.—If the cream is fresh and liquid enough to pour freely the sample may be taken by pouring from one vessel to another three times and immediately dipping a small quantity into a bottle; add three drops of formalin, and cork tightly to prevent evaporation of moisture. If left in an open jar, especially in hot weather, evaporation takes place rapidly and this would increase the test, causing inaccurate results.

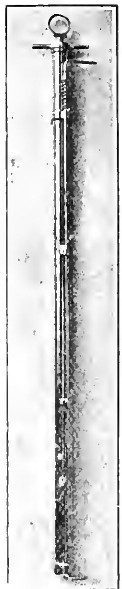
If the cream has set, as it does when it is thick and ripe, the sample must be taken with a Wheal sampler (Fig. 10). This cuts a complete core from top to bottom of the can giving an accurate sample and an aliquot part of the cream. The whole syringeful is taken into the bottle. The cream should be separated so as to contain between 40 and



8.—Reading Milk Test.



9.—Reading Cream Test.



10.—Cream Sampler.

50 per cent. fat; then there should be no difficulty in getting a correct sample. When liquid enough the cream may be mixed by means of a plunger, consisting of a saucer-shaped disc attached to a rod.

The Wheal sampler is like a syringe, and the piston must be kept tightly packed so that, when the thumb is placed on the open end of the tube and the rod drawn out to its full length, a complete vacuum is created; on releasing the rod it runs right back to the thumb.

Making the test.—The Babcock test is based on the assumption that 18 grammes weight of the material to be tested is delivered into the flask. A 17.6 c.c. pipette will deliver 18 grammes of milk into the flask; but, with cream testing 40 to 50 per cent. fat, 17.6 c.c. would only weigh 15 to 16 grammes owing to the difference in the specific gravity. It is

therefore provided by law that cream shall be weighed directly into the flask.

For this purpose sensitive scales are used (Fig. 4*b*). These are obtainable for about 25s. The sample bottles should be placed in water, of from 90 to 100 degrees, until the contents are fluid enough to run freely. The flask is then balanced on the scales; approximately by the counterpoise on the beam, then by small shot or pellets of paper on the tray. The weight is moved along the beam to the 9 gramme mark, and the cream (being thoroughly mixed) is run in with a pipette until the weight is balanced. If a drop too much is run in it may be removed by a fine tube which can be inserted to the bottom of the flask. Nine grammes of cream, instead of 18, are taken because the flasks in use in this country (Fig. 6) are graduated to 30 per cent., and all the fat of 40 per cent. cream would not go into the graduated neck. Nine c.c. of water is then run in. After adding 17.5 c.c. sulphuric acid, shake until the casein is all dissolved. There is a frosted spot on the flask on which a number should be marked with an ink pencil to correspond with the number of the sample. The procedure now is the same as with milk.

In reading the cream test, the fat is measured from *a* to *c*, not to *d* or *b* (Fig. 9). The cream flasks are graduated for 18 grammes and as 9 grammes have been taken, the reading has to be doubled.

To calculate the result.—The weight of cream is multiplied by the test and divided by 100. This gives the amount of butter fat that the factory should pay for.

Example.—A can of cream contains 95 lbs. net. The test reads 22. Then $22 \times 2 = 44$, gives the correct percentage of fat in the cream.

$95 \times 44 \div 100 = 41.8$ lbs. butter fat in that can of cream.

Skim Milk.

It is quite as important to test the separator milk as to test the cows. Frequently, very heavy loss is experienced owing to the separator getting out of order or as a consequence of its not being properly worked. A check should therefore be kept by regularly testing the skim milk.

Special double necked flasks (Fig. 7) are used for testing skim milk. They have a wide tube, reaching nearly to the bottom of the flask, through which the milk and the acid are run in. As the graduated neck is of small bore, it is possible to estimate the loss of fat clearly.

Take 17.6 c.c. of skim milk into the flask, as in new milk, and 17.5 c.c. or a little more acid may be used—up to 20 c.c. It is better to add half the acid first and mix it with the milk, then add the remainder and shake the contents of the flask until all the casein is dissolved. The mixing must be done carefully, so that none of the liquid may be forced into the graduated neck and thus lost. The flask must be placed in the machine with the graduated neck towards the outside, so that, while the machine is running, the graduated neck will be uppermost; otherwise, some of the fat may lodge behind the tube and not rise into the neck. The procedure then is the same as with new milk. The loss of fat, as indicated by this test, should be kept below .1 per cent. or one-tenth of one per cent.

It is best to use rain water for testing where possible. If spring water containing lime, &c., is used, it may cause froth to appear on top of the fat column. This should be avoided.

COMPARATIVE RECORD OF COWS FOR SEASON 19 .

Name of Cow.	Date of Birth.	Date of last Calving.	Days in Milk.	Milk.	Test.	Butter Fat.	Price.	—		
				lbs.		lbs.		£	s.	d.

Adult Cows.

2nd Calf Heifers.

1st Calf Heifers.

Year.	No. of Cows.	Total Milk Produced.	Average Milk per Cow.	Average Test.	Total Fat.	Price.	Total Value.			Average per Cow.		
			lbs.		lbs.		£	s.	d.	£	s.	d.

RECORD OF DAIRY COW.

Name of Cow .. ..   Da'e of Birth ... .

Calved........ .. ..   Days in Milk ....

Date of Test.	Milk.	Day's Milk multiplied by Number of Days since last Test.	Test.	Fat for Day.	Fat for Period.	Total Milk to Date.	Total Fat to Date.
	lbs.					lbs.	lbs.

Total Butter Fat for Lactation Period.......lbs. at.......per lb. = £.......

Total Milk...................

Remarks...

....

....

Note.—If the day's weight be taken at regular intervals, and the weight multiplied by the number of days since last weighing, the result will be a very close approximation to the total amount of milk given. Of course, the better way is to weigh the milk every day.

DISEASES OF SHEEP.*

By W. A. N. Robertson, B.V.Sc., Chief Veterinary Officer.

The subject that I have been asked to address the farmers in convention upon—Diseases of Sheep—is of very great importance, yet I fear, with the limited time at my disposal, it is one which can be no more than touched upon, and only a few of the complaints common to sheep can be dealt with. Recognising this difficulty, and still further recognising the confusion that would arise in the minds of most sheep-owners if I were to attempt to describe too many diseases in a short or scrappy manner, it is my intention to deal mainly with some of the causes of disease in general; for, if these are known, more than half the battle is won. It is an old axiom in medicine that if you remove the cause the effect will cease, the effect being that series of symptoms of ill-health which we term disease. This aspect requires to be deeply engraven in the minds of all interested, not only in sheep, but in all live stock. Therefore, we should endeavour, firstly, at preventing a cause from operating; and, secondly, if some cause does operate, we should try to remove it.

In no class of live stock should preventive measures against disease be taken more than in the case of sheep, for it is an animal which does not show many very characteristic symptoms when ill, and which does not respond readily to medicinal treatment.

The animal body must always be considered as a very delicate and complicated machine, and one which is easily thrown out of efficient running. Most farmers take some care of their engines on the farm by providing proper fuel, lubricant, and shelter; yet it is far easier to repair or replace a worn-out part of such a mechanical contrivance than it is to effect recovery in the living tissue. The animal frame is composed of a very large variety of substances, which require to be present in certain definite proportions for the efficient working of the whole. These substances can, under natural conditions, be obtained only from the food. When present, all the tissues are first—in the growing animal—built up in a healthy manner, and then maintained in this condition; but it is not only necessary that these substaces should be given to the animal; they must be present in such a form as to be readily assimilated or taken into the system. There are juices or fluids present in the system, which have the power of digesting or making the component parts of a food suitable for absorption. If these juices are not present in sufficient quantity or quality, or if there is any derangement of their proportion, then the full benefits cannot be derived. This is indicated by indigestion, failing health, poverty, &c., and a general lowering of vitality, which open the way for harmful products, whether they be derived from external or internal sources, to exert an influence and produce serious effects.

Under normal conditions and as a result of digestion of food in the animal body some very powerful poisons are formed. The body, however, is prepared for such happenings, and when they occur, the poisons

* Paper read at the Annual Conference of the Chamber of Agriculture, Colac, July, 1918.

are converted into harmless substances by other juices formed by the body. Think for a moment of the effect of stopping the formation of such antidotal substances. The poison would have full power to exert its influence, and if death itself did not actually result, ill-health or disease would certainly follow. In much the same way nature provides that poisons, in the shape of disease-producing germs, introduced from without, shall be fought against by the system up to what might be termed the breaking point. If the poison is in too large a quantity, or the fighting agency is reduced in power, then the breaking point is reached, disease develops, and symptoms become manifest. The agents in the body engaged in this fight are the white blood corpuscles. It is, therefore, evident that these must be kept up to full fighting strength if success is to be looked for. Now, these corpuscles are formed in the body from substances taken into the system by means of the food, or, at least, their vitality is maintained by the supply of proper nourishment to them. We, therefore, see that if the whole body is to attain its greatest efficiency, it is necessary to supply proper food.

We know from experience that some parts of the State are more suitable for stock than others; that certain classes of stock will thrive in parts where other classes fail. Along the coast bone diseases are common. Some districts show heavy mortality annually (in cattle particularly) from impaction and so on. It is not merely a question of quantity of feed, but it is essentially one of quality. Provided the quality be maintained, the living machine is kept working at full efficiency, and it requires a considerable amount of disturbing influence to seriously upset the equilibrium. If you are using bad oil in your engine you know that you cannot obtain full power, and very little extra friction or work will stop the machine. If you are using bad fuel in the living machine it too will perform its functions badly. The reserve force or vitality of the animal is impaired, and the system is exposed to the influence of any of the injurious substances—of which there are so many—ever ready to operate to the detriment of health.

It is, therefore, evident that the vitality of the animal must be maintained at its highest pitch. Now, unfortunately, vitality cannot be measured; indeed, it is hard to describe. Many are under the impression that provided an animal is fat it is healthy. This, however, is not necessarily so. Many an animal in good condition has a very low vitality. There are some ailments—and fluke in sheep may be taken as an example—in which the earliest effect of invasion is to cause the animal to lay on fat, yet its vitality is lowered. Another condition is seen in ewes, particularly crossbred ones, carrying twin lambs.. They are fat, yet death is common, mainly because the vitality is lowered, and they are ready victims to the influence of poisons produced within the body.

The soils of Victoria generally are deficient in salts of various forms, and manures are necessary to attain maximum yields of crops. We know that stock in certain districts are fond of chewing bones. eating bark, licking paint; if they are taken to the sea from inland they lick the sand or drink sea water. All this indicates that the

animal economy is trying to obtain something for which there is a craving. Whilst this condition exists, the vitality is not at its highest, and the body is easily reacted upon by harmful influences. A large number of owners provide salt as a lick for their sheep. Experience has taught them that their stock "do" better. What has actually occurred is that vitality has been increased, the functions of the body are carried out more faithfully, digestion is stronger, and the animals are able to obtain more nourishment from their food, and consequently are less subject to disease than others not supplied with salt.

Unfortunately there are many sheep-owners who, though they see good results—maybe—on their neigbour's property, are satisfied to turn their flock into a paddock in which there is plenty of grass of a kind, and to rest on the policy, referred to in my last address, of "That'll do," until sickness occurs, and then to jump to the conclusion that some mysterious disease has broken out, and wire to the Department for help.

While salt has shown itself to be very beneficial, it will be found much more advantageous to supply a compound lick. One which has proved its value is composed of 20 parts of lime, 20 parts of salt, 10 parts of superphosphate, and 5 parts of sulphate of iron. By supplying such a lick an even balance is maintained in the digestive juices of the system, and those necessary for the preservation of health are maintained at their maximum supply, and all the functions of the body are carried out in the manner provided for by nature. In other words, vitality is high, and the sheep are enabled to resist to their maximum the ill-effects of poisonous substances, whether they be produced within the frame or introduced from without.

Let us turn now to a consideration of some of the more common diseases of sheep. They may be divided into two groups—contagious and non-contagious. Fortunately, we are in a country very free from the former. Anthrax occurs occasionally in isolated instances. I do not propose to say more of this disease than that it kills very suddenly, and the carcass quickly decomposes, and shows a bloody discharge from the natural openings. When such deaths occur on a farm, the owner should regard them as highly suspicious, and treat them as if they were anthrax. An ear of the animal should be removed close to the head. This should be wrapped in cottonwool and posted addressed to the Chief Veterinary Officer, Department of Agriculture, Melbourne. Upon this ear, provided sufficient blood is present, a diagnosis can be made, and much valuable time thereby saved. At the same time a piece of clean flat glass should be obtained, and a few drops of blood placed thereon. The glass should then be left exposed to the air until the blood has dried. In no circumstances should it be dried by artificial heat, nor should another piece of glass be put on top of it, as this will spoil the smear for the purposes of a diagnosis. The carcass should next be burned on the spot whereon it lies, as to drag it to a more convenient spot will probably spread the disease. Anthrax is a disease which is communicable to man, and care is necessary in handling it. While it is such a fatal disease, it is fortunately one from the ravages of which stock may be saved by inoculating them with vaccine which gives them immunity from attack.

Another disease which causes a fairly high mortality is one which has been described, for want of a better term, as a Braxy-like disease. True, Braxy does not exist in Australia, but the disease under consideration resembless it in almost all its characteristics, and differs from it mainly in that the organism responsible for it is unlike the Braxy organism in some of its characteristics. The disease is one which occurs only in the winter months, and then chiefly on low-lying, damp pasture. Young sheep are more frequently affected than the mature animals.

The disease is in some respects like anthrax, being acute, and causing death frequently, without any symptoms being noted. Generally the onset is sudden. The animal is dull, and cannot be induced to rise; movement appears to produce pain; the posterior parts of the body become swollen; and froth may appear at the mouth. On *post-mortem*, dark purple areas will be found in the lining membrane of the fourth stomach, the intestines distended with gas, and decomposition of the body will occur rapidly, and the carcass give off a most objectionable stench. The blood will be dark in colour, but clotted; the liver will be light coloured and soft, and the kidneys in the same condition; the skin will assume a blue tint, and the wool will pull out readily. The lesion in the stomach is most characteristic, and in it the bacillus which causes the disease is found. So far no method of treatment or system of inoculation has been discovered.

All that can be done is to move the sheep to higher and drier pasture, and to endeavour to clear the affected areas by allowing a growth of grass and burning off at later date. On pasture which is well drained there is seldom any loss.

Another disease which may be classed as contagious, and which on occasion is responsible for heavy mortality, is known as malignant œdema. This is a disease caused by an organism which gains entrance to the system through cuts, and is usually found only at shearing time. The soil of the yards and their surroundings becomes infective, and sheep turned out with cuts on their bodies are thus inoculated with the germs. As the symptoms develop there is a stiffness of the body with jerky movements, breathing is fast and painful, unconsciousness sets in, and death rapidly follows. Treatment is valueless; therefore, we must direct all our energies to prevention. This is done by burning all carcasses, disinfecting the yards and soil, and cleaning the shed. Hot soda solutions are advisable for the latter and quicklime for the soil, with all antiseptic precautions and treatment of wounds.

Tetanus or Lockjaw.

This is another germ disease, and, like malignant œdema, follows on shearing or the operation of marking and castration; but differs in that it does not occur until the wounds have practically healed. The animal becomes stiff, and the head is held high; the eyes are withdrawn into the sockets; there is difficulty in mastication, which may become impossible; the animal is easily startled, and such starts induce spasms of the whole body. Treatment is useless, but the same preventive measures must be adopted as are required for malignant œdema.

Non-Contagious Diseases.

Turning now to some of the non-contagious diseases affecting sheep, we may notice one which, from the number of animals affected, appears to be contagious. Stomatitis is the technical term for an inflammatory condition of the mouth. It may be either due to local irritation or to a specific organism when it becomes contagious. This latter is unknown in Australia, but the former is somewhat common in sheep, and particularly lambs. The first symptoms noted are an increased flow of saliva, which dribbles from the mouth; there is difficulty in grasping food; the mouth is hot to the touch, and deeply injected with blood; an eruption of small blisters is next seen, which may turn to an ulcerated condition, extending outside the mouth, over the lips, and to the nose. After the pustules break, dark scabs form, or the whole nose and mouth may present a blistered appearance. The cause must be looked for in the food. The eating of rough forage containing prickles or spines, such as nettles, nibbling grass around the base of thistles, or the eating of plants infested with insects which exert a blistering action, is the common cause.

It is frequently reported as occurring in sheep fed on rape, and here it is usually found that the rape is heavily infested with aphis. It appears that this insect, when bruised, exerts a strongly irritant action, especially if the rape is wet with dew or rain. In these circumstances, the irritant substance can gain easy access to the skin by virtue of the water present. Therefore, sheep should never be turned on to rape until the sun has dried off the dew, &c. Then, though there may be some soreness produced, it will be of a mild form. There being a common cause, many animals become affected, and this leads to the conclusion that an infectious disease is present. In all cases the cause must be searched for and removed. The immediate symptoms may be relieved by washing the mouth with some mild antiseptic lotion, such as boric acid, a teaspoonful to a pint, and smearing the nose and external sore parts with carron oil. Under this line of treatment the parts quickly heal, and recovery takes place.

Diarrhoea.

This is a common complaint, and causes considerable loss in lambs, not so much from losses as the result of the disease, but rather from the subsequent falling off in condition. In the great majority of cases it is due to infestation of worms of a very small variety—so small as to escape the eye unless specially looked for. They resemble short, fine hairs. Treatment should aim at removing the cause, and a drench of from one to two teaspoonfuls of turpentine in six to eight ounces of linseed oil will be found useful. Following this, the system must be built up, and a lick as already suggested will induce a marked improvement in the sheep. Indeed, if such a lick is available for sheep at all times they will seldom become infested by the worm mentioned or any of the other parasites common to the sheep, of which there is a large variety. They all produce somewhat similar symptoms—wasting and anæmia. The influence of vitality is very noticeable in the effect worms have upon the system. As soon as an animal becomes debilitated worms increase in numbers enormously, and produce death from

exhaustion; whereas in an animal of high vitality they have little effect, and appear not to develop to any great extent.

Nearly all the worms of sheep are passed in the egg by one animal and are later taken in with food or water by another, when full development occurs. It is not necessary for an intermediate host, as is the case with tape worms and fluke. Therefore efforts should be made to destroy the eggs, which require a certain amount of moisture for existence. The drainage of pasture, or the keeping of sheep on high lands during winter, will, by preventing development or infestation, as the case may be, amply repay the farmer. Old stagnant waterholes are a source of danger, and an illustration of this was recently reported in the *Journal of Agriculture.* A breeder in the western part of the State had great difficulty in rearing lambs prior to the drought. Since then sheep have thriven on his property. The reason is, that prior to the drought sheep drank from a lagoon. This becoming dry, the owner was forced to sink for a supply of water. A mineral spring was found, and since then sheep refuse to drink from the lagoon, and all are thriving. Here the twofold benefit is seen of supplying salts of various kinds and avoiding infestation from the lagoon.

Worms in sheep probably cause a greater loss to farmers in Victoria than any other complaint. To fully deal with the subject is outside the scope of this paper; further, it is a question which has already received attention, and a leaflet on *Worms in Sheep,* written by Dr. S. S. Cameron when occupying the position of Chief Veterinary Officer, has been issued by the Department of Agriculture, and may be obtained on application, free of cost.

There is an enemy of the sheep of only recent arrival in Victoria, upon which, in conclusion, a few words may be said, viz., sheep bot fly. This fly deposits its eggs in or around the nostril of the sheep. The larvæ crawl thence up the nostril into the cavities of the face and head, and there develop. They remain in these positions for nine or ten months, and when fully matured are dropped or sneezed out. The pupæ lie on the ground for a short time, and then hatch out to the perfect fly, and the life cycle is once more commenced. The infestation does practically no harm. A sneezing and discharge from the nose may follow, but only when the infestation is very heavy is there sufficient irritation to produce giddiness and staggering gait, wasting, and death. Usually there is nothing more noticed than a dullness in the sheep, and maybe disinclination to feed.

Treatment is valueless. When the larvæ are lodged in the sinuses of the head the injection of drugs, &c., seldom reaches them, and is liable to do more harm than the parasite itself. Inhalations of sulphur fumes by stimulating coughing and sneezing may remove those directly in the passages, but, seeing that ill-effects are so seldom seen, this is hardly worth the trouble of carrying out. An endeavour may be made to prevent the fly from attacking the sheep, and this is best carried out by providing battens, placed about two inches apart, over a trough of food or over the lick. These battens should be smeared with tar, and in an endeavour to get to the food or lick, the sheep smears its nostrils with tar. This system requires for its success, first a small flock, and second frequent applications of tar.

BEET SUGAR.

Report by W. L. Williams, Manager, Sugar Factory, Maffra, of his Visit to America to Investigate the Beet Sugar Industry.

I left Melbourne on 25th September, 1917, and returned thereto on 1st February, 1918.

Numerous firms and individuals were visited and consulted, and their assistance and courtesy was much appreciated. All the most important American beet areas were visited, as well as the following representative Beet Sugar Factories:—

Spreckles' Sugar Mill, California.
Tracy Sugar Mill, California.
Mantecka Sugar Mill, California.
Oxnard Sugar Mill, California.
Santa Anna Mill, California.
West Jordan Mill, Utah Idaho Sugar Company.
Great Western Sugar Company, Denver.
Greeley Sugar Mill, Colorado.
Eaton Sugar Mill, Colorado.
Fort Collins Sugar Mill, Colorado.
Windsor Sugar Mill, Colorado.
Brighton Sugar Mill, Colorado.
Mason City Sugar Mill, Iowa.
Columbia Sugar Mill, Bay City, Michigan.

Also the Ewa Can Sugar Factory, Honolulu, as well as sundry Construction and Equipment firms.

Without going into statistical details, it should be sufficient here to state that, for the year 1917, ninety-three beet sugar factories were in operation throughout the United States, and it is estimated that their total output should be about 875,000 tons of sugar, or 86 per cent. of the total production of the States, the other 14 per cent. being cane sugar. At the time of my visit, there was a shortage of sugar in America.

Although construction at present is very costly, several new factories were in course of construction. The Government is using every means to encourage growers to expand the production of beet sugar, and all factory plant may be imported free of duty.

The price paid for beets last year ranged from 7 to 8 dollars a ton. Labour generally was dearer than in Victoria. The price of sugar at New York and San Francisco was fixed at 7.35 cents per lb., equal to £34 6s. a ton, as against £29 7s. 6d. a ton in Victoria. The industry in America is undoubtedly very active, the factory plants efficient, and profits often reputed to be high; but some of the natural conditions, due to climate, do not appear to be as favorable as in our own country. With the exception of the limited areas in the Eastern States, the industry depends on irrigation, supplied by open channels or sub-artesian wells. Frosts sometimes cause trouble in the mid-west. The beet seed situation, owing to the war, has been, and is, very acute, but gradually the companies are producing larger and quite satisfactory supplies of home-grown seed. The enterprise of those associated with the American beet sugar business is, perhaps, its most prominent feature.

After what I have seen, my conclusions regarding beet growing at Maffra, and in Victoria generally, are as follows:—

Beet Growing Operations.

Considerably larger areas of beet must be sown in order to make the industry a thorough success at Maffra.

Our field work, as far as it goes, compares favorably with American methods, but the economic importance of crop rotation and irrigation cannot be too strongly emphasized. While on principle opposed to forcing anything on the grower against his will, I have come to the conclusion that, in order to demonstrate the value of irrigation to this and other industries, the Government should proceed with the Boisdale irrigation scheme, permitting those settlers favorably disposed to use the water, and allowing the balance a limited time to decide whether they would accept or forego their water rights. Subsequently, the unallotted water rights might be turned over to outside growers adjacent to the settlement area. The comparatively small direct loss that might be involved for a term would, I feel sure, be immensely outweighed by the direct and indirect advantages that would eventually accrue to Central and East Gippsland. The rich States of California, Utah, Colorado, and others in America, would be comparatively barren without irrigation. The cane sugar-growers of the Hawaiian Islands spend £15 10s. an acre for irrigation, and the very evident results in such areas lead me to believe that our rich river flats would handsomely respond to irrigation.

Two beet harvesting implements likely to save much labour are to be thoroughly tried in America next season; but, as practical use will probably suggest many improvements, it is well to await results..

The beet seed situation is so acute that America has buyers abroad and growers at home giving the matter keen attention. Some of the companies are now largely growing their own seed with success; and, if we can secure a little high-grade standard seed from France each year, we should endeavour to follow the American example.

I was impressed with the utility of the small caterpillar oil tractors in use on so many of the beet and general farming areas.

Factory Operations.

Considering our conditions, the Maffra Factory accomplished excellent results last season, but the fact must be stated that the plant is largely out-of-date, incomplete, and at some points, very weak.

If the quantity of beet warranted it, a good construction firm should be asked to remodel the factory; but, as sufficient raw material is not yet assured, I will simply state some of the important improvements that appear to be necessary, and should be quietly aimed at:—

Larger beet bins, with dirt, weed, and rock catchers.
A clean beet automatic weighing machine.
An auxiliary beet slicer—French type for preference.
Cossette bearing chains in diffusion battery cells.

A series of juice heaters, using vapours from the evaporators or surplus exhaust steam.

The need of heaters is most important for speed, capacity, fuel economy, and improved juices.

Remodelled carbonatation and sulphur tanks.

A set of Kelly or Sweetland presses, for economy and additional capacity.

A new vacuum pan, with independent copper coils, is desirable for first sugars; this is very necessary, in order that the present large pan might become available to boil seconds, which, under the conditions now obtaining, are not receiving proper attention.

The preceding alterations, while not affecting the crystallizers, would probably necessitate the addition of a second granulator.

A sugar storeroom, with sugar conveyors, automatic weigher, counter and bag-sewing machine, is urgently required.

Several of the present juice pumps should be replaced by centrifugal pumps.

Our steam boiler system is neither satisfactory nor economical, and should be replaced as soon as convenient by an efficient set of boilers, probably W. and B. type. This would necessitate an alteration of a large part of our present steam-pipe system, but it is fast becoming essential.

Some American factories are largely electrifying their plants.

Details of manufacturing processes vary in almost every factory. As far as practicable, changes in this respect will be tried out quietly at Maffra, while many improved methods cannot be applied at all until the plant is modernized.

If the factory were remodelled, and could be run at full capacity, the addition of a pulp-drying plant, the Steffen's process, and evaporators for reducing the waste product to a saleable potash solution, would be well worth consideration.

The suggested alterations would make for much greater efficiency, capacity, economy, and safety, but, desirable as they are, I could not recommend incurring the necessary expense on the present supply of beet. Consequently, I recommend that for the time being such alterations as are most necessary, urgent, and within our means, be quietly effected. Because of the great difficulty and cost of securing plant just now, we must trust to our ingenuity to hold the weak points in action until such time as conditions make it possible to remodel the plant.

Should a new factory be established in Australia, the constructor's advice should be sought regarding alterations, &c., at the Maffra Factory. The two most important and experienced construction firms in America are the Larrowe Construction Company, Detroit, and the Dyer Construction Company, Cleveland.

General Matters.

The above report is brief and general, but, should any statistics or special details be required, I shall be pleased, as far as I am able, to submit whatever is desired.

I believe, with irrigation, the Maffra district is capable of producing enough sugar beet to fully support a remodelled factory, and thereby promote a most desirable, intense, and valuable rural industry.

American organizations are good, but expensive, and I believe an Australian staff, given the right opportunity, is quite capable of satistorily controlling the technical, mechanical, and all other duties pertaining to the industry. Under the White Australia policy, there is no doubt room and need for both beet and cane sugar growing in Australia, as in America.

As a Repatriation Scheme, I believe it is, for very many reasons, a most desirable industry.

The world's demand for sugar is increasing, and the supply is not nearly equal to requirements, which means that the present price of sugar is unlikely to decrease for some time to come. Furthermore, the cost of labour in all the important cane-growing countries is increasing, thereby adding to the cost of cane sugar production.

The need of greater production occasioned by the war, and the very great national importance of quickly populating this vast country, compels me to express the opinion that the beet sugar industry should be encouraged in the southern areas of Australia. At the same time, the industry should not be introduced in any district that has not been thoroughly tested and proved to have favorable natural conditions.

Experiment alone will show whether dry irrigable areas are preferable to good natural rainfall areas. The former hold pride of place in America, and the latter in Europe.

AGRICULTURAL RESEARCH IN AUSTRALIA.

The Commonwealth Advisory Council of Science and Industry has published as Bulletin 7, entitled "Agricultural Research in Australia," the papers read at a Conference of Agricultural Scientists from all the States, held in Melbourne in November, 1917, together with summaries of the discussions that took place and the resolutions passed by the Conference. This Bulletin should be read by all who are interested in the progress of Australian agriculture, and is obtainable free of charge from the Secretary of the Council, 314 Albert-street, East Melbourne. The subjects dealt with by the Conference covered a very wide field, including the breeding of cereals, the cultivation of native grasses and fodder-plants, fibre-plants, tobacco, sugar-crops and crops for the production of power-alcohol, the acclimatization of plants, immunity of plants to disease, the utilization of Australian phosphates, and the best methods of stimulating agricultural research.

NOTES ON VINE BLACK SPOT OR ANTHRACNOSE.

By F. de Castella, Government Viticulturist, and C. C. Brittlebank, Government Pathologist.

The abnormal rainfall of the last two seasons is responsible for a quite unusual prevalence of fungus pests of all kinds, among which Vine Black Spot has made itself very conspicuous. Injury of a disastrous nature has been wrought in many districts where, for over twenty years previously, the fungus was practically unknown. Consternation has naturally been caused in many quarters, as a result of which several misleading ideas have gained currency. It has, for example, been stated that the recent outbreak was caused by a new fungus, which developed in the soil, whence it found its way into the sap of the vine, &c. Such fears are quite groundless; the fungus with which we have to deal is as old as civilization, having been well known in ancient Greece and Rome. The disease and its treatment were dealt with by the present writers at some length in these columns just a year ago; the notes which follow are intended to be supplementary to that article, a reprint of which is obtainable on application.

The following paragraph from it may be here quoted:—

> As regards the future: Given a return to normal spring weather, unfavorable to its spread, the disease will no doubt revert to the unimportant position it has so long occupied. But if we fail to get a dry spring, and if no preventive steps are taken, grave damage is not only probable, but certain. A repetition of last year's weather might easily lead, in the absence of treatment, to a real disaster to growers of Sultanas and other susceptible varieties, owing to the abundance of the fungus in its hibernating or resting stages, in which it awaits the return of spring to renew its activity.

The worst fears then expressed have, unfortunately, been only too fully realized; not only was the wet weather of 1916-17 repeated, but the 1917-18 season proved very much wetter, so much so, that the fungus re-appeared with a virulence hitherto unknown in this State. In many sultana vineyards, especially in those which had suffered to some extent during the previous season, the visitation was altogether disastrous, resulting, in many cases, to entire destruction of the 1918 crop, and such severe injury to pruning wood, that little fruit can be expected in 1919. Other varieties have suffered in varying degree.

Even in new districts, where it was difficult, twelve months ago, to find scars for demonstration purposes, the disease has now obtained a considerable foothold. Though a slow-spreading fungus as compared with Downy Mildew or Oidium, it has been steadily disseminated through the agency of birds, insects, &c., facilitated by the extraordinarily suitable weather conditions, until it is now sufficiently plentiful to constitute a menace of extreme gravity to growers of all vine varieties susceptible to the disease.

In view of these facts, very thorough treatment cannot be too emphatically urged. We may briefly recall that, in order to be thoroughly reliable, treatment must be twofold; it must consist of—

(*a*) The *winter swab,* designed to destroy, in the greatest measure possible, the hibernating or wintering forms of the fungus.

(*b*) *Spring and summer sprayings* with copper mixtures, to prevent the spread of the fungus, resulting from the development of any wintering forms which may have escaped destruction by swabbing.

THE WINTER SWAB.

The following is the formula now recommended as most generally satisfactory:—

35 lbs. Iron Sulphate.
8 lbs. Sulphuric Acid.
10 gallons Water.

For convenience in measuring the acid, it may be mentioned that an ordinary wine bottle (reputed quart size) holds 54 ozs., or nearly $3\frac{1}{2}$ lbs. of sulphuric acid.

To make the solution, place the iron sulphate crystals in a wooden tub or barrel, pour the sulphuric acid over them, add the water (preferably hot), taking care to avoid splashes of the acid; stir occasionally until dissolved. If the iron sulphate is dissolved first, and the acid added subsequently, this should be poured in, in a thin stream, with constant stirring to avoid splashes.

It will be observed that the solution now recommended contains somewhat more acid than that suggested a year ago. Several considerations have lead to this alteration, mainly the extreme virulence of the disease last season, and the great abundance of sclerotia, or wintering forms, left by it. Though the 3 to 5 per cent. acid previously recommended is capable of destroying the sclerotia, the higher percentage of acid should necessarily prove even more fatal to them; the extra cost per acre is trifling, and if an error is made, it is well that it should be in the direction of extra efficiency.*

Some growers may even prefer to bring the acid strength up to 10 per cent. Though such does not appear to be necessary, there is no serious objection to doing so. In France, damage, in the shape of splitting of the wood of the vine, has sometimes been reported after swabbing with 10 per cent. sulphuric acid (without iron sulphate). In Mildura last season, some growers who used up to 10 per cent. acid, with iron sulphate, found that no damage was done to the wood. Obviously, a couple per cent. of acid more or less will neither make nor mar the swab.

Thoroughness of application is probably of greater importance than actual percentage of acid; any sclerotia missed by the swab will naturally survive, irrespective of acid strength.

Simplification by discarding the iron sulphate and swabbing with 10 per cent. sulphuric acid only, is sometimes suggested; this is not recommended, the complete formula given above is certainly preferable.

Though the manner in which the iron sulphate acts is not very clear (see previous article), its value in increasing the efficiency of the swab seems undeniable; it is corroborated both by French and Australian

* It is worthy of note that French authorities have for many years been content with a solution containing 1–2 per cent. acid, 3 per cent. being rarely recommended. Quite recently, however, increased strength is being advised—the latest formula published going as high as 8 per cent. (Degrully, *Progres Agricole* 1917).

Widely different formulæ have been lately recommended varying from 50 per cent. iron sulphate, with 2 per cent. sulphuric acid, to 5 per cent. iron sulphate with 10 per cent. sulphuric acid.

experience. Possibly it serves to give more "body" to the swab, which, as it dries, leaves a pasty mass of highly acid crystals in cracks and scars where the sclerotia lurk.

As regards the application of the swab, there is little to add, except that the spraying outfit largely used in Mildura last season appears to have given very general satisfaction; it certainly saves labour, and enables a considerably larger area to be treated in the same time; in this, in fact, lies its chief danger. There is a tendency to go too fast, and to sacrifice efficiency to speed. For this reason, several careful growers still prefer the old-fashioned swab.

The Double Swab.

French authorities are very generally agreed as to the greater efficacy of a double swab; in other words, a repetition of the application after a lapse of a fortnight or so. The reason for this greater efficiency is not very clear; possibly the first application may have a preparatory action, rendering the sclerotium more vulnerable.

On vines which suffered severely last season, the double application is strongly recommended. The two swabbings should be so timed that the second, which follows a fortnight or three weeks after the first, shall be executed just before the buds break in spring.*

A Supplementary Copper Sulphate Spray.

In cases where the vines have suffered most severe damage, such as would justify extra drastic treatment, this supplementary spray is worth trying. It should be made with a 5 per cent. copper sulphate solution, just as the buds are bursting. Even though a certain amount of burning of the first leaves may occur, fungicide action of considerable value would probably result, and this at a critical period for the fungus. Though copper sulphate has no effect on the wintering stage, such an application would catch, just as they are sprouting, the tender processes which will bear the conidia or summer spores, and which arise in spring from such sclerotia as may have been missed by the swab. This supplementary spray must not be looked upon as a regular treatment to be applied to all vineyards; it is only suggested as an emergency precaution, of a somewhat experimental nature, for vines which have suffered unusual damage. Being entirely soluble, it would soon be washed off by rain, and would need to be quickly followed by spraying with Bordeaux Mixture, which is about to be described.

Spring and Summer Spraying.

Were it possible to completely destroy all wintering forms, no further treatment would be necessary; unfortunately, such cannot be hoped for. Some sclerotia will inevitably survive, but it must be remembered the more thorough the swabbing, the fewer the survivors.† Given weather conditions suitable for fungus development, fresh infection will thus be caused, which must be combated by spring and summer treatment.

* A preliminary swabbing has recently been suggested in late autumn or early winter (about May), such as would catch the recently formed sclerotia, which are then less resistant than in mid-winter. Very early pruning of vines to be thus treated is, of course, necessary.

† Investigations now being conducted by one of us show that on thoroughly swabbed vines a very limited number of sclerotia are capable of germinating when placed in a moist chamber at suitable temperature.

European authorities are unanimous in considering the winter treatment to be very much more efficacious than any that can be applied during the growing period of the vine, so far as this particular fungus is concerned. Until quite recently, in fact, many authorities freely expressed the view that copper sprays, so valuable against Downy Mildew, are of little use in combating Black Spot. Mixtures of lime and sulphur have long been held to be the standard treatment of Black Spot during the growing period of the vine. At Mildura last season, such dustings were extensively applied, with most disappointing results, the experience in this district being quite in accord with more recent views in France, in which country a marked change of opinion is evident within recent years. Amongst other authorities, Professor Ravaz urges the efficacy of preventive copper sprays to combat Anthracnose during the growing period of the vine. The following two quotations will suffice. Referring to treatment of Anthracnose in *Progrès Agricole,* of 8th June, 1913, he says:—

> "During summer scientific mixtures of lime and sulphur have been prescribed, the efficacy of which has always been equal to that of a blister on a wooden leg. . . . . The disease is amenable to copper. Copper sprays are efficacious against it, provided they are applied frequently during rainy weather, or even if moist conditions should prevail."

Again, replying, in *Progrès Agricole,* of 10th May, 1915, to a vinegrower, whose military duties had prevented him from swabbing, and whose wood was shockingly damaged, he writes:—

> "Failure to swab does not leave us altogether disarmed against Anthracnose. It, also, is amenable to copper sprays. But, as it attacks canes and bunches as well as leaves, treatment must be so applied that the base of the canes and the young stalks are well coated with copper. One must not be content with *blessing* (*i.e.,* sprinkling with holy water) the young shoots; they must be *bathed,* as the Italians say. Subsequent treatments against Mildew will also control Anthracnose."

The efficacy of copper sprays against Anthracnose receives striking confirmation from the fact, very noticeable to any visitor to Europe, that this disease is much less in evidence nowadays than it was forty years ago. This is not because climatic conditions do not now suit it, but because the copper sprays so extensively applied to combat Downy Mildew have a strong restraining effect on Anthracnose. It is, indeed, chiefly in connexion with direct producers* that Anthracnose is heard of nowadays in France.

The greater prevalence of the disease on these vines is not due to any special liability to it, but to the fact that they are not protected by the copper sprays which must be applied against Downy Mildew to pure vinifera varieties.

That copper sprays should protect vines against Black Spot is not astonishing; their mode of action is absolutely similar to that by which they protect the vine against Downy Mildew, viz., on properly sprayed

* By direct producers are understood the hybrid vines raised of recent years to at the same time resist phylloxera and yield wine of fair quality. Many of these possess such a high resistance to Downy Mildew that spraying can be dispensed with.

vines, every rain or dew drop dissolves a trace of copper, sufficient to prevent the germination of any fungus spore which may fall into it. It is scarcely necessary to repeat that Black Spot is a fungus which must be prevented; it cannot be cured. It is not astonishing that the same means of prevention, so effective in the case of Downy Mildew, should also enable us to control Black Spot.

The number of spring or summer sprayings required must be largely governed by weather conditions. In a very wet spring, several applications will be necessary, the essential point is that the first spraying should be early enough. It should be applied as soon as the young shoots are a couple of inches long, on all vines where the fungus was in evidence last season. This spray should be repeated a fortnight or so later, in order to protect all growth which has been made subsequent to the first application. Further spraying may be necessary in a wet spring.

There is a tendency in some quarters to rely entirely on spring and summer treatment. We must lodge an emphatic protest against such. It should be needless to point out that the fewer the spores in spring, the more effective will be the protection of preventive copper sprays; the prevalence of such spores is obviously enormously reduced if the bulk of the wintering forms are destroyed by efficient swabbing at the close of winter.

The composition of Bordeaux Mixture and Copper Soda, in fact, of copper fungicides in general, will be dealt with in a subsequent issue; it will be sufficient to here state that standard Bordeaux Mixture, containing 2 per cent. of copper sulphate, with enough lime to neutralize, constitutes the best protection against Anthracnose during the growing period of the vine.

Cultural Considerations.

Where vines have been severely affected, advantage should be taken of any modification in cultural methods which may tend to lessen liability to fugus contamination, during the growing season.

The air in the vicinity of freshly-worked land is always moister than that overlying land which has not been recently disturbed. The dew point, and, consequently, the amount of dew deposited, is greater in the former case, thus increasing the chances of infection. Winter cultivation should be completed as early as possible, so that the land will not be in recently-worked condition in early spring. Such cultural work as must be carried out among sprouting or actively growing vines in spring, should be executed as soon after spraying as possible, so as to profit by the protection thereby afforded whilst at its maximum. The spray might also follow the plough or cultivator on the same day, though it must be remembered that the traction of the spray outfit would be heavier on the newly-worked soil.

The presence of weeds, and particularly of cover crops (green manuring), acts in similar manner to freshly-worked soil. The vineyard must be so worked as to insure the absence of either of these at periods when contamination is to be feared.

Irrigation must be carefully regulated, both as regards quantity of water applied and time of application. Wherever vines suffered severe damage last season they should be sparingly watered; a heavy crop cannot be expected from such vines; the best one can hope is to provide

healthy wood for future seasons. Withholding of water, in the greatest measure possible, will greatly promote this object.

The condition of the growing portion of the vine, as regards succulence, has also considerable bearing on receptivity for infection; moderate growth, which is rather dry and hard in its nature, fears infection less than rank, sappy growth. Anything tending to insure the former condition will lessen danger; in this connexion, too little, rather than too much, water is strongly recommended. Likewise with manuring—phosphatic and potassic manures give tone to the plant, and tend to increase resistance to disease. Dressings with lime and gypsum will, by liberating combined potash, exercise a similar action. Nitrogen, on the other hand, especially if in excess, tends to promote rank growth; it should be cautiously used, though it must be remembered that vines which suffered severe damage last year are depressed in their vegetation, and require building up.

Attention to these cultural points is certainly desirable; nevertheless, too much must not be expected of them. They are only supplementary to, but in no sense a substitute for, the standard treatment (swabbing and spraying), which alone can afford reliable protection.

BLACKBERRY vines are most difficult to eradicate, especially as merely cutting down occasionally tends to strengthen the root growth, and ultimately to increase the trouble.

Where the pest is confined to a small area, intended for constant cultivation, trenching to a depth of 18 inches to 2 feet, and removing all growth to that depth, is the surest way, though laborious. Every part —roots, butts, and vines—should be burnt.

The treatment recommended by the Department is the caustic soda method. This chemical, of a strength of 1 lb. caustic soda to 2 gallons of water, has the advantage of being much less dangerous to animal life than arsenical solutions. It is best applied as follows:—

On small areas, first cut the vines down close to the ground, and remove them from the area for burning later. Then, from a watering-can, with the rose attached, give the surface from which the vines have been cut a thorough soaking of the above solution. The area is then left until a new growth springs up, and has grown to 4 or 5 inches high. It is not necessary to cut this growth down, but it is advisable to give it a further soaking of the solution, which will soon kill more of the tops and root, but, perhaps, still will not kill the lot. This process will need to be repeated, so as to keep the leaf growth in check, for it is only by keeping the tops down that the roots can be ultimately killed.

On larger areas it will be best to use a mounted spray pump outfit, using an Edgell release valve to regulate the flow of spray.

A solution of arsenite of soda acts in a similar way, but owing to its highly poisonous nature, and the danger from children picking the fruit, it is not recommended.

A flock of sheep or goats kept on an infected area for a few months helps greatly in eradicating this pest. It is best to tether the goats, and to move them about as soon as they have nibbled off all the green shoots. —*Agricultural Gazette of New South Wales*, June, 1918.

A CONTRIBUTION TO THE STUDY OF HEREDITARY UNSOUNDNESS IN HORSES.

By W. A. N. Robertson, B.V.Sc., Chief Veterinary Officer.

(Continued from page 303.)

Family 2.

All the horses in this family are related to one another, being descended from one progenitor, as shown in the following scheme:—

			Not examined	–Not examined, 2.1
			Not examined	–Not examined, 2.2
		Not examined		
	Not examined		Not examined	–Not examined, 2.3
			Not examined	–Not examined, 2.4
Not examined				Not examined, 2.5
		Not examined	–Not examined	
				Not examined, 2.6
	Not examined	—Not examined	–Not examined	–**Sidebone,** 2.7

For convenience, and because of the distant relationship, they are dealt with separately. Only one of the original members (2.7) was examined, and he was found to be unsound; none of his progeny has been seen. His dam was by a stallion which was not examined, 9.5; but unsoundness has been found in 21.5 per cent. of his progeny. This probably accounts for the unsoundness present in 2.7.

The members of the family show the following percentage of unsoundness:—

FAMILY 2.

Table Showing Percentage of Unsoundness.

Sires.	Sons.			G Sons.			GG Sons.			GGG Sons.			GGGG Sons.		Total.		
	Examined.	Unsound.	Percentage.	Examined.	Unsound.	Percentage.	Examined.	Unsound.	Percentage.	Examined.	Unsound.	Percentage.	Examined.	Unsound.	Examined.	Unsound.	Percentage.
2·1 ..	4	2	50·0	83	17	20·5	180	35	19·4	33	3	9·0	1	..	301	57	18·9
2·2 ..	1	1	100·0	14	7	50·0	7	..	..	..	..	..	..	..	22	8	36·3
2·3 ..	2	2	100·0	4	..	..	..	..	..	..	..	..	..	..	6	2	33·3
2·4 ..	..	..	..	5	2	40·0	2	..	..	..	..	..	..	..	7	2	28·5
2·5 ..	..	..	..	14	5	..	24	6	25·0	2	2	100·0	..	..	40	13	32·5
2·6 ..	1	..	..	2	..	..	9	1	11·1	..	..	..	..	..	12	1	8·3
2·7 .. Unsound	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	100·0
Total	8	5	62·5	122	31	25·4	222	42	18·4	35	5	14·2	1	..	388	83	21·3

2.1 is a stallion which was not examined. He has the reputation of being a sound horse, and mares by him were eagerly sought by breeders; his male descendants, however, show 18.9 per cent. unsoundness.

Whilst 16 of his sons are referred to in the tables, only 4 were examined, and 2 of these were unsound, viz., 2.105 and 2.102. The dam of the former was by a half-brother of 2.7, which was unsound; and the dam of the latter was by 3—the founder of a most unsound line. It is

possible, therefore, that this 2.1 family is either sound or one in which unsoundness is a diminishing factor. A general survey of the family supports the former possibility, for it will be seen that the unsoundness noted is scattered through the many sub-families recorded, and most of the dams that can be traced are from unsound lines. The transmission of unsoundness through the dams is especially noticed in the next generation, where we find that 83 grandsons were examined, and 20.5 per cent. found unsound. Though the breeding of many of these unsound animals cannot be traced through their dams to horses recorded in the tables, the following records suggest that their unsoundness has come from the dams' side:—

The dam of 2.164 was by 3.18. He was not examined—two of his progeny were, and both were unsound.

The dam of 2.165 was by 17.2, not examined; he left 77 per cent. unsound out of 9 examined.

The dam of 2.10301 was by a son of 3, already referred to as a sire of a most unsound line.

The dam of 2.103008 was by a son of 6. 21 per cent. of the progeny of 6 were unsound.

The dam of 2.1030007 was by 7.231, and the granddam by 4.13, which left 38 per cent. unsound descendants.

The dam of 2.10300006 was by 2.1, the granddam by 22, whose blood appears frequently in unsound pedigrees.

The dam of 2.10300009 was by a son or grandson of 1.

Four of the members of this generation found unsound are by 2.102, himself unsound, and two of them, viz., 2.1023 and 2.1024, are out of mares by 1. Thus very strong evidence as to the source of the unsoundness can be given in the majority of the sideboned grandsons of 2.1.

Among the great-grandsons, 19 per cent. were unsound; and, again, evidence of unsoundness being transmitted from the dams is strong.

2.1013 and his descendants are evidently a sound line; only one son, 2.101303, was sideboned, and this at 3 years old. His dam was by 1.003111, an unsound horse.

2.10414 was from a mare by an unrecorded grandson of 3.1; the recorded grandsons show 40 per cent. unsoundness.

2.10231 and 2.10234 are by the unsound sire 2.1023, carrying the blood of 1.

2.1031 is another branch evidently sound. There are 2 unsound sons. One, viz., 2.10316, was from a mare by 1.19, which was very unsound; while 2.10315 was from a mare by 9.521, which, though no unsoundness was discovered in the few of his descendants examined, is a member of a family showing 21 per cent. of unsoundness.

The next family in this generation worthy of note is that of 2.1032, himself sound at ten years of age. He left 17 sound and 9 unsound sons; 20 sound and 3 unsound grandsons; 2 of the latter are by unsound sires, whilst the sons which are unsound show the following breeding on their dam's side.

The pedigree of the dams of 2.10325, 2.1032004, 2.1032007, and 2.1032008 is incomplete, but the remaining unsound horses of this branch show breeding as under:—

The dam of 2.10326 was by 3.1005, a member of an unsound family, which left 43 per cent. of unsound progeny.

The dam of 2.103205 was by 7.492, which, as already referred to, appears so frequently in unsound lines.
The dam of 2.103206 was by 7.34, of tainted line.
The dam of 2.103207 was by 6.2, of tainted line.
The dam of 2.1032005 was by 7.492, of tainted line (already referred to).

A branch of the family which appears an unsound one is 2.1034 and his descendants. He was not examined, but he left 3 unsound stallions out of 5 examined, and the dams of these three were as follows:—

2.10342 was out of a mare by 1.13, a very unsound horse.
2.10343 was out of a mare by 1.1, the sire of a very unsound family.
2.10344 was out of a mare by 7.231, an unsound line.

In the same generation, we find:—

2.1030031 out of a mare by 2.1032, the granddam by a son of 11.
2.1030032 out of a mare probably by 1.211, which was without doubt unsound.
2.1030037 out of a mare by 22.2, of unsound family.
2.1030039 out of a mare by 9.521, which left 21 per cent. unsound.
2.10300305 out of a mare by 6.15, of tainted family, granddam by 9.521.
2.1030071 out of a mare by a brother of 1.1, an unsound horse.
2.10300051 out of a mare by 4.127, unsound blood, granddam by a son of 3.
2,10300052 out of a mare by 6, a tainted line.

Stallion 2.10302 requires more than passing notice. He was by a son of 22, from whom he, no doubt, inherited the unsoundness detected when he was an aged horse. However, it must be noted that the unsoundness was not pronounced. Eight of his progeny were examined, and it appears strange that no unsoundness was detected in any of them. It is unfortunate that the full pedigrees of the dams of these horses are not available; but, from the particulars available, it appears likely that the tendency to develop sidebones was not pronounced. Unsoundness will probably be found in some of them at a later date. Two of the sons, 2.103021 and 2.103023, were full brothers, but of blood not recorded, and of which nothing is known. It is probable that the dam was particularly sound. 2.103025, only 3 years at examination, is a horse in which unsoundness might be expected at an early date, as his dam is by 3.102, an unsound horse.

The number of the remaining members of the family 2.1 is insufficient upon which to base criticism.

2.2 is badly tainted with unsoundness. One son and seven grandsons are affected with sidebone; while seven grandsons and seven great-grandsons are sound.

2.2105, which was over twelve years of age at examination, was sound, although by an unsound horse. His dam must have been a horse of good age when he was born, as her sire was by the grandsire of 2.5, shown in the opening table of this family. Evidently, she was particularly sound, or some trace of sidebone would have appeared in 2.2105.

2.5 was probably sound, although in the family of his son 2.51, unsoundness predominates. This can be accounted for by the fact that 2.51 was from a mare by 1.1, a very unsound sire. The other son, 2.52, apparently carried the sound blood of 2.5, for of his progeny which are sound, 6 are seven years old or over, and the unsound ones are tainted in nearly all cases through the dams, as follows:—

> 2.525 was not examined, but his progeny is very unsound. He was from a mare by 9.31, and of the seven sons of this horse examined, 5 are affected with sidebone, and 2 with bog spavin; thus 71 per cent. were sideboned. Of the remainder of the progeny of 2.525 which can be traced through the dams—
>
> 2.5253 was from a mare by 1.511, a sire of unsoundness.
> 2.52511 was from a mare by 7.232, a sire of unsoundness.
> 2.52512 was from a mare by 7.232, a sire of unsoundness.
> Stallion 2.52023 carries the blood of 1 and 9 in his veins.
>
> Thus most of the unsoundness in this line can be attributed to the influence of the mare.
>
> 2.6 appears to be another sound horse, though only twelve of his progeny have been examined. Only one, 2.61133, is unsound, and the dam of this horse is by an unrecorded son of 3.1, already noted as being unsound. The table shows that six of the remaining members of this line were five years of age or over at examination, and were found sound.

The complete tables for Family 2 are as follows:—

FAMILY 2.

2	2·1, not examined	2·11, not examined	2·111, sound, 3		
		2·12, sound, 9	2·121, sound, 4		
		2.13, not examined	2·131, bog spavin, 3		
		2·14, not examined	2·141, sound, 3		
		2·15, not examined	2·151, sound, 4		
		2·16, not examined	2·161, sound, 3		
			2·162, sound, 4	2·1621, sound, 3	
			2·163, sound, 5		
			2·164, **sidebone**, 5		
			2·165, **sidebone**, 5		
		2·17, not examined	2·171, sound, 3		
		2·18, not examined	2·182, sound, 4		
			2·183, sound D.A.P., 2		
			2·181, shiverer, 4	2·1841, sound, D.A.P., 4	
			2·181, **sidebone**, 3		
		2·19, not examined	2·191, sound, 3		
		2·101, not examined	2·1011, sound, 3	2·10111, sound, 5	
			2·1012, sound, 6	2·10121, sound, 3	
			2·1013, sound, 5	2·10131, sound, 3	
				2·10132, sound, 5	2·101321, sound, 4
					2·101322, sound, D.A.P., 5.
				2·10133, sound, 3	
				2·10134, sound, 5	
				2·10135, sound, 4	
				2·10136, sound, 5	
				2·10138, sound, 3	
				2·10139, sound, 3	
				2·101301, sound, 3	
				2·101302, sound, 3	
				2·10137, sound, D.A.P., 5	
				2·101303, **sidebone**, 3	
			2·1014, sound, 3		
			2·1015, sound, 3		
			2·1016, sound, 5		
			2·1017, sound, 3		
			2·1018, sound, 3		
			2·1019, sound, 3		

Family 2—*continued.*

- 2
  - 2·1, not examined—*continued.*
    - 2·104, not examined—
      - 2·1041, not examined
        - 2·10412, sound, 3
        - 2·10413, sound, 3
        - 2·10411, sound, D.A.P., 6
        - 2·10414, **sidebone**, 5
      - 2·1042, sound, 4
      - 2·1043, sound, 5
    - 2·105, **sidebone**, 6
    - 2·106, not examined—
      - 2·1061, sound, 5
      - 2·1062, sound, 4
      - 2·1063, sound, 3
      - 2·1064, sound, 9
      - 2·1067, sound, 6
      - 2·1068, sound, 3
      - 2·1065, **sidebone**, 4
      - 2·1066, **sidebone**, a
    - 2·107, sound, a
    - 2·102, **sidebone**, 15—
      - 2·1022, sound, 3
      - 2·1025, sound 3
      - 2·1026, sound, 3
      - 2·1028, sound, 3
      - 2·1029, sound, 3
      - 2·10201, sound, 3
      - 2·10203, sound, 4
      - 2·1021, **sidebone**, 5 —
        - 2·102011, sound, 6
        - 2·102012, sound, 5
      - 2·1023, **sidebone**, 4 —
        - 2·10232, sound, 3
        - 2·10233, sound, 5
        - 2·10231 **sidebone**, 6
        - 2·10234. **sidebone**, 3
      - 2·1024, **sidebone**, a
      - 2·1027, **sidebone**, 3
      - 2·10202, **sidebone**, 6
    - 2·103, not examined
      - 2·1031, sound, 7
        - 2·10311, sound, 3
        - 2·10313, sound, 5
        - 2·10314, sound, 4
        - 2·10318, sound, 5
        - 2·10319, sound, 3
        - 2·103102, sound, 3
        - 2·103103, sound, 4
        - 2·103104, sound, 5
        - 2·103105, sound, 3
        - 2·103106, sound, 5
        - 2·103107, not examined—
          - 2·1031071, sound, 5
        - 2·103108, sound, 5
        - 2·10312, sound, D.A.P., 5
        - 2·10317, sound, D.A.P., 5
        - 2·103101, sound, D.A.P., 4
        - 2·10315, **sidebone**, 5
          - 2·103151, sound, 3
        - 2·10316, **sidebone**, 4
      - 2·1032, sound, 10
        - 2·10321, sound, 3
          - 2·103211, sound, 3
          - 2·103212, sound, D.A.P., 3
        - 2·10322, sound, 5
          - 2·103222, sound, 3
          - 2·103223, sound, 5
          - 2·103226, sound, 5
          - 2·103224, sound, D.A.P., 4
          - 2·103225, sound, D.A.P., 5
          - 2·103221, **sidebone**, 4
        - 2·10323, sound, 6
        - 2·10324, sound, 3
        - 2·10327, sound, 5
        - 2·10328, sound, 5
        - 2·10329, sound, 5
          - 2·103291, sound, 3
          - 2·103292, sound, 3
          - 2·103293, sound, 5
          - 2·103294, sound, 5
          - 2·103295, sound, 5
          - 2·103296, sound, 5
          - 2·103297, sound [D.A.P., 5
        - 2·103203, sound, 4
        - 2·103204, sound, 6
        - 2·103208, sound, 5
        - 2·103209, sound, 6
        - 2·103202, sound, 4
          - 2·1032021, sound, 3
        - 2·1032002, sound, 5
          - 2·10320021, sound D.A.P., 5
        - 2·1032003, sound, 4

Family 2—*continued.*

- 2
  - 2·1, not exam'd —*contd.*
    - 2·103, not exam'd —*contd.*
      - 2·1032, sound, 10—*continued.*
        - 2·1032001, sound, 5
        - 2·1032006, sound, 3
        - 2·103201, sound, D.A.P., 4
        - 2·10325, **sidebone**, 3
        - 2·10326, **sidebone, ringbone**, 3
          - 2·103261, sound, D.A.P.
        - 2·103205, **sidebone**, 5
        - 2·103206, **sidebone**, 3
        - 2·103207, **sidebone**, 3
        - 2·1032004, **sidebone**, 3
        - 2·1032005, **sidebone**, 6
          - 2·10320051, **sidebone**, 3
        - 2·1032007, **sidebone**, 4
        - 2·1032008, **sidebone**, 5
          - 2·10320081, sound, D.A.P., 3
          - 2·10320082, sound, D.A.P., 3
          - 2·10320083, **sidebone**, 5
            - 2·103200831 sound, 3
          - 2·10320084, sound, 4
      - 2·1033, not examined
        - 2·10331, sound, 3
        - 2·10333, sound, 3
        - 2·10332, sound D.A.P., 8
      - 2·1034, not examined
        - 2·10341, sound, 5
        - 2·10342, **sidebone**, 6
        - 2·10343, **sidebone**, 5
        - 2·10344, **sidebone, ringbone**, 4
        - 2·10345, shiverer, 4
      - 2·1035, sound, 3
        - 2·10353, sound, 3
        - 2·10354, sound, 3
        - 2·10356, sound, 5
        - 2·10357, sound, 5
        - 2·10358, sound, 3
        - 2·10359, sound, 4
        - 2·103501, sound, 5
        - 2·103502, sound, 2
        - 2·103503, sound, 3
        - 2·103504, sound, 2
        - 2·103505, sound, 6
        - 2·103506, sound, 4
        - 2·10355, sound D.A.P., 6
        - 2·10351, **sidebone**, 5
        - 2·10352, spavin, 2
      - 2·1036, sound, 3
      - 2·10303, sound, 3
      - 2·10305, sound, 4
      - 2·10309, sound, 3
      - 2·103005, sound, 5
      - 2·103006, sound, a
      - 2·1037, not examined
        - 2·10371, sound, 3
      - 2·10304, sound, 3
        - 2·103041, sound, D.A.P. 2
      - 2·10306, not examined
        - 2·103061, sound, 4
        - 2·103062, sound, 4
        - 2·103063, sound, D.A.P., 5
      - 2·10307, sound, 4
        - 2·103071, sound, 7
      - 2·10308, sound, a
        - 2·103081, sound, D.A.P., 3
      - 2·103001, not examined
        - 2·1030011, sound, 3
      - 2·103002, sound, 5
        - 2·1030021, sound, D.A.P.
        - 2·1030022, sound, D.A.P., 4
      - 2·103004, not examined
        - 2·1030041, sound, 3
        - 2·1030042, sound, 5
      - 2·1039, not examined
        - 2·10391, sound, 4
        - 2·10392, sound, 5
        - 2·10393, sound, 3
        - 2·10394, sound, 7
        - 2·10395, sound, 5
      - 2·103003, sound, 4
        - 2·1030033, sound, 3
        - 2·1030034, sound, 7
        - 2·1030035, sound, 5
        - 2·1030038, sound, 4
        - 2·10300302, sound, 4
        - 2·1030036, sound, D.A.P., 4
        - 2·10300301, sound, D.A.P., 3
        - 2·10300304, sound, D.A.P., 3
        - 2·1030031, **sidebone**, 3
        - 2·1030032, **sidebone**, 3
        - 2·1030037, **sidebone**, 4
        - 2·1030039, **sidebone**, 3
        - 2·10300303, **sidebone**, 2
        - 2·10300305, **sidebone**, 4

Family 2—*continued.*

2	2·1 not examined —*con'd.*	2·103, not examined—*continued.*	2·103007, sound, 8	2·1030073, sound, 2	
				2·1030074, sound, 4	
				2·1030075, sound, 3	
				2·1030076, sound, 4	
				2·1030071, **sidebone,** 4	
				2·1030072, **sidebone,** 5	
			2·103009, sound, 6	2·1030092, sound, 3	
				2·1030091, **sidebone,** 4	
			2·1030001, sound, 5		
			2·1030002, sound, 6		
			2·1030003, sound, 3	2·10300031, sound, 4	
				2·10300032, sound, 3	
			2·1030004, sound, 4	2·10300041, sound, 5	
				2·10300042, sound, 5	
				2·10300043, sound, 3	
				2·10300044, sound, 3	
				2·10300045, sound, 3	
			2·1030005, not examined	2·10300053, sound, 4	2·103000531, sound, D.A.P., 3
				2·10300055, sound, 6	
			2·1030006, sound, 4	2·10300056, sound, 5	
				2·10300057, sound, 4	
			2·10300003, sound, 5	2·10300059, sound, 5	
				2·103000501, sound, 6	
			2·10300005, sound, a	2·103000502, sound, 5	2·1030005021, sound 4
			2·10300007, sound, 4	2·103000503, sound, 5	
				2·103000504, sound, 3	
			2·103000001, sound, 3	2·103000505, sound, 3	
				2·103000507, sound, 4	
			2·103000002, sound, 3	2·103000508, sound, 3	
				2·103000509, sound, 4	
			2·103000003, sound, 3	2·10300054, sound, D.A.P., 3	
			2·103000004, sound, 4	2·10300051, **sidebone,** 5	
				2·10300052, **sidebone,** 4	
				2·10300058, curb, 3	
				2·103000506, spavin, 3	
			2·1030008, not examined	2·10300081, sound, D.A.P., 5	2·103000811, sound, D.A.P., 2
			2·1030009, not examined	2·10300091, not examined	2·103000911, sound, 3
				2·10300093, sound, 3	
				2·10300096, sound, 5	2·103000961, sound, 5
				2·10300097, sound, 3	
				2·10300092, sound, D.A.P., 4	
				2·10300095, sound, D.A.P., 8	
				2·10300094, roarer, 4	
			2·10300001, not examined	2·103000011, sound, 3	
				2·103000012, not examined	2·1030000121, sound, D.A.P., 4
			2·10300002, not examined	2·103000021, sound 3	
			2·10300004, not examined	2·103000041, sound, 6	
			2·10300008, not examined	2·103000081, **sidebone,** 5	
			2·103000005, not examined	2·1030000051, sound, 3	
				2·1030000052, **sidebone,** 4	
			2·103000006, not examined	2·1030000061, **sidebone,** 4	
			2·1038, **sidebone,** 4		
			2·10301, **ringbone,** 3		
			2·10302, **sidebone,** a	2·103021, sound, 4	
				2·103022, sound, 3	
				2·103023, sound, 5	
				2·103024, sound, 4	
				2·103025, sound, 3	
				2·103026, sound, 3	
				2·103027, sound, 3	
				2·103028, sound, 4	
			2·103008, **sidebone,** 3		
			2·1030007, **sidebone,** 5	2·10300071, sound, D.A.P., 3	
				2·10300072, **sidebone,** 4	
			2·10300006, **sidebone,** 5		
			2·10300009, **sidebone,** 5		

FAMILY 2—*continued.*

2	2·2 not examined	2·21, **sidebone,** a	2·211, **sidebone,** 3	2·2111, sound, D.A.P., 3	
				2·2114, sound, D.P.A. 3	
				2·2112, sound, 3	
				2·213, sound, 3	
			2·212, **sidebone,** 3		
			2·213, sound, 3		
			2·214, sound, 5		
			2·215, sound, 3		
			2·216, sound, 2		
			2·217, not examined	2·2171, sound, 5	
			2·218, sound, 3		
			2·2105, sound, a		
			2·2106, sound, 4		
			2·219, **sidebone,** 10		
			2·2101, **sidebone,** 3		
			2·2102, **sidebone,** 10	2·21021, sound, 5	
				2·21022, sound, 4	
			2·2103, **sidebone,** 4		
			2·2104, **sidebone,** 4		
	2·3, not examined	2·31, not examined	2·311 sound 4		
			2·313, sound, 5		
			2·314, sound, 5		
			2·312, sound, D.A.P., 3		
		2·32, **sidebone,** 9			
		2·33, **sidebone,** a			
	2·4, not examined	2·41, not examined	2·411, sound, 5		
			2·412, sound, 6		
			2·415, sound, 10	2·4151, sound, D.A.P., 4	
				2·4152, sound, 5	
			2·413, **sidebone,** 10		
			2·414, **sidebone, ringbone,** 4		
	2·5, not examined	2·51, not examined	2·512, sound, a		
			2·511, **sidebone,** 8		
			2·513, **sidebone,** 4	2·5131, sound, D.A.P., 3	
			2·514, **sidebone,** 7	2·5141, sound, 2	
				2·5142, sound, D.A.P., 3	
		2·52, not examined	2·521, sound, a		
			2·523, sound, 3	2·5231, sound, 5	
			2·525, not examined	2·5252, sound, 3	
				2·5251, **sidebone,** a	2·52511, **ringbone, sidebone,** 3
					2·52512, **sidebone,** 3
				2·5253, **sidebone,** a	
			2·526, not examined	2·5262, sound, 4	
				2·5263, sound, 6	
				2·5261, **ringbone,** 5	
			2·527, sound, 8	2·5271, sound, 3	
				2·5272, sound, 5	
				2·5273, **ringbone,** 5	
			2·528, sound, 5		
			2·529, sound, a		
			2·5201, sound, a	2·52012, sound, 7	
				2·52011, **sidebone,** 5	
			2·5202, sound, 7	2·52021, sound, 5	
				2·52022, sound, 4	
				2·52024, sound, 5	
				2·52026, sound, 3	
				2·52025, sound, D.A.P., 3	
				2·52027, sound, D.A.P., 7	
				2·52023, **sidebone,** 9	
			2·5203, **sidebone,** 7		
			2·5204, **sidebone,** a		
			2·5205, sound, 10	2·52051, sound, 3	
			2·5206, not examined	2·52061, sound, 4	
	2·6, not examined	2·61, not examined	2·611, not examined	2·6111, sound, a	2·61111, sound, 5
					2·61112, sound, 5
			2·612, sound, a	2·6112, sound, 5	
				2·6113, not examined	2·61131, sound, 5
					2·61132, sound, 3
					2·61134, sound, 3
					2·61135, sound, 3
					2·61133, **sidebone,** 4
			2·613, not examined	2·6131, not examined	2·61311, sound, 4
					2·61312, spavin, 3
	2·7, **sidebone**				

AUSTRALIAN POMOLOGY.

Report of the Pomological Committee of Australia for 1918.

E. E. Pescott, F.L.S., Secretary, Pomologist, Department of Agriculture, Victoria.

The fifth meeting of the Pomological Committee of Australia was held at Adelaide, South Australia, in April, 1918.

The following delegates were present:—Messrs. Geo. Quinn, Chief Horticultural Officer; G. Laffer, M.P.; H. Wicks, representing South Australia. Messrs. J. M. Ward, Fruit and Forestry Expert; and L. M. Shoobridge, representing Tasmania. Messrs. W. J. Allen, Fruit and Irrigation Expert; J. Neil, and F. J. Adamson, representing New South Wales. Messrs. E. E. Pescott, F.L.S., Pomologist, Department of Agriculture (Secretary); and James Lang, J.P., representing Victoria.

Amongst the visitors who assisted in the deliberations were:—Messrs. J. F. Bailey, Director of the Adelaide Botanic Gardens; G. C. Savage, Manager of the Berri Experiment Farm, South Australia; J. Cronin, Curator of the Melbourne Botanic Gardens; R. E. Boardman, A.F.I.A., of the *Fruit World;* A. F. Thiele, Doncaster, Victoria; and W. Champion Hackett, South Australia.

In opening the Conference, Professor Perkins, Director of Agriculture for South Australia, heartily welcomed the Committee to Adelaide, and said that the intricate work on which the Committee was engaged, and which would possibly take years to disentangle, would be of great service.

Professor Perkins freely offered the services of the Department to assist the Committee in its work.

The retiring President, Mr. L. M. Shoobridge, in a short opening address, referred to the war, which resulted in the stoppage of the oversea carriage of fruit. Tasmania was now evaporating her apple crop, and, in doing so, relieved and assisted the other States. The work of the Committee was not simply for the naming of fruits; the testing of new kinds and new seedlings was a far more important work. The Committee should take up other questions, such as woolly aphis, blight-proof stocks, and the standardization of fruits. Mr. Shoobridge urged that advantage should be taken of the Commerce Act, so as to have all fruit shipped under the approved names. He thought that the value of the meetings of growers and experts was very considerable, and much good would result from federated action.

Reference was made to the loss by death of two members, Dr. Benjafield, and Mr. C. C. Tucker. The loss of the former would be especially felt by the Committee, as he was one of the greatest authorities on pear nomenclature.

Mr. G. H. Laffer, M.P., of South Australia, was then elected Chairman. The following resolution was passed by the fruit-growing members of the Committee:—"That the importance of the work of the Committee be placed on record; and that we also record the forethought that moved our ex-President, Mr. L. M. Shoobridge, to initiate the movement; and also to record the whole-hearted assistance he has rendered to the Committee since its inception; lastly, that we appreciate the interest

taken and the help given by the respective State Governments, and their officers."

1917 Report.

In the discussion on the report for 1917, regret was expressed that the States of Queensland and Western Australia were not yet represented. Mr. Bailey considered that the work of the Committee was of vital importance to growers in Queensland, especially to those in the south, where apples were largely grown.

The necessity for a wider scope of work, taking in all kinds and varieties of fruits, was urged by several members; and it was decided that stronger efforts should be made by the State sub-Committees, and that they should meet frequently in the soft-fruits' season, and forward reports to the general Committee.

By means of sub-Committee meetings in each State at regular intervals right through the berry, soft fruit, and citrus fruits seasons, all faults belonging to these classes could be considered and reported to the general annual meeting.

Woolly Aphis.

Mr. Allen presented a most exhaustive list of apple varieties, and their degrees of resistance to Woolly Aphis. The list comprised nearly 300 varieties, which were classified as—(*a*) Proof or highly resistant; (*b*) Slightly affected; and (*c*) Badly affected.

After considerable discussion, it was decided to request that the *Fruit World* should issue a special number dealing with Woolly Aphis, in which Mr. Allen's list could be published.

Publication of Records.

It was agreed that each report be brought up to date, showing a list of approved names and changes. The total approved list therefore appears at the end of the report.

In this list of names so compiled, appear several names of fruit which the Committee does not recommend for planting generally. The purpose of the inclusion of these names is that nurserymen have been distributing the trees for many years, and that the fruits are in general cultivation. The Committee is of opinion that the growing of such varieties will gradually cease as more suitable ones become known.

It was further decided that the Committee, having now laid the foundation of Australian Pomology, should publish illustrations and analytical details of fruits, on the lines laid down by Hogg and others, and each State Government officer on the Committee will compile, for publication in the *Journal of Agriculture* of his State, details of the history and analysis of the principal apple and pear seedlings.

American Pomological Society.

A letter was received from Professor E. R. Lake, Pomologist to the United States Federal Bureau of Agriculture, inviting a delegate to the Pomological Conference to be held at Washington in 1919-20; and also suggesting that more simplicity be used in fruit nomenclature, one word to be used for a name in most cases, and such terms as "Beurre," and other similar ones, to be dropped.

After much discussion, it was decided to adhere to existing rules as far as possible in the naming of Australian-raised fruits, and to avoid the use of more than one word wherever practicable. It was felt, however, that to drop such terms as "Beurre," "Pippin," and others, in certain established cases, would interfere too much with old-established pomology of other lands. The Committee does not wish to unduly interfere with names of fruits raised elsewhere, especially seeing that it is anxious for the adoption of its own nomenclature in other countries.

PEACHES AND PLUMS FOR CANNING.

Mr. Allen introduced this subject, and urged that the Committee should collect information regarding these fruits. In the course of discussion, the question of a suitable peach to succeed Elberta was brought up. Mr. Wicks suggested Tuscan Cling, and also mentioned a New South Wales peach, Golden Queen, all yellow in colour, and much like Phillips, and which comes in just before Pullar's Cling. Mr. Savage, however, said that Golden Queen is very distinct from Phillips. Lewis, he said, ripened later than either of these, while Allen's Late Cling is the latest peach at Blackwood, even hanging on the trees after the leaves have fallen.

Mr. Wicks reported that, in his opinion, Phillips is *the* peach for canning; the fruits hang on the trees for three weeks. Speaking of other varieties, he said that Sims comes in just after Tuscan (Tuskena), and is probably not quite suitable. Riverside Late Red, which follows Thiele's Cling, is much like Pullar's, only Pullar's is rounder, and the first-named has colour on the stone. Riverside keeps its foliage very late in the season. McDevitt's is not a good canner. Mr. Wicks expressed the belief that the Orange Cling fruits much better when the laterals are left.

It was decided to collect information on canning for report in 1919.

Consideration of Seedlings: Apples.

"Jackson's Seedling".—Reported as free from woolly aphis, the tree being twenty years old. The ripening period is in March, about Jonathan time. The apple is now recorded as a blight-resistant variety, but is not recommended as a commercial apple on account of its inferior flavour.

"Ernie's Seedling".—An apple of the Granny Smith type, grown near the Queensland border, where the average rainfall is 32 inches. It is a seedling from Stone Pippin, a heavy cropper, slightly subject to bitter pit, much inferior to Granny Smith, but ripens earlier. The parent tree is nine years old, and has not taken blight up to the present time. As the fruit shows quality, the variety is being tested at the Glen Innes orchard, and will be reported upon in three years' time.

"Hornsby".—Ripens in April; a fine, deep-red colour, apparently a good retail dessert apple, of fair quality; juicy, crisp, and slightly sub-acid; evidently a good keeper, of good appearance and even outline. Subject to woolly aphis. Approved.

"Thompson's Red".—Ripe in mid-January, and follows Carrington; has plenty of fine deep colour, and is well-established in New South Wales as an early commercial apple. It is of good flavour, and does not clash with any other in time of ripening. Approved.

"Aitken".—Has been distributed as "Carrington" in Victoria and South Australia. Aitken is a conically-ribbed and red-streaked apple.

"Goondarin," formerly "Brown's Pippin".—Ripe in February, of very good colour and form, similar to Tasman's Pride. Slightly affected with woolly aphis. It is a good local apple, and has commercial possibilities for early export.

"Cowell," formerly "Cowell's Red Streak".—A good eating apple, very early, ripens first or second week in January. Recommended as an early apple for coastal districts in New South Wales.

"Tasman's Pride".—Considered a very good apple, rather free from black spot, and subject to woolly aphis. It is not recommended for planting in large areas for export.

"Glengyle".—Was approved in 1914. It is recommended for planting in place of Rome Beauty in Victoria and South Australia; is to be further tested in New South Wales and Tasmania; is possibly a very suitable apple, and would colour well in West Australia and Tasmania.

"Brown's Red".—An apple from Goondarin Creek, reported as not subject to woolly aphis. Might be useful for stock.

"Teralba Seedling".—Apple from H. Hansen, Cardiff, reported as blight-proof, a good keeper, not attractive in appearance, possibly useful only for stock; to be called "Teralba."

Reports for 1919.

The following apples and pears are to be considered by the State sub-Committees, and reported on at the next session in 1919:—

Apples.

"Penang," formerly "Granny Hunter".—Not an attractive apple, ripens in February, and may be of some value as an eating apple; no record for disease.

"Mill Park Seedling".—Grown near Queensland border, where the average rainfall is 60 inches; of good flavour, but too large for dessert; ripe at the end of April; reported free from woolly aphis; will apparently succeed in a wet district.

"Harry's Favourite".—Grown at Meadow Flat, Rydal, annual rainfall 32 inches, reported free from woolly aphis, but not black spot. The tree is a heavy cropper, and blossoms in the middle of October. The parent tree is 30 years old.

"Taylor's Seedling".—To be further reported on.

"Ebenezer Pippin".—Worthy of trial for testing in State experimental orchards; a late fruit.

"Red Seedling".—From R. D. Best, Tanmangaroo.

Seedling from Mr. Warren, of Cardiff.

"Aitken".—(*See* consideration of seedlings.)

Seedling from J. Bulmer, of Lavington, near Albury.—Ripens in January, the earliest-ripening apple in the New South Wales cool dis-districts; highly resistant to woolly aphis.

"Brown's Favourite," formerly "Brown's Seedling".

Seedling from T. F. Simmon, Upper Colo.

"Finn's Seedling," No. 2.

"Shepherd's Seedling".—Re-submitted from 1917; a good, firm keeping apple belonging to the Stone Pippin tribe. The Committee was favorably impressed with this in 1917.

"Frampton".—Grown at the Government Orchard, at Blackwood, and reported upon as free from woolly aphis; grown also at Bathurst.

W. E. Kirkness, Gosford—Seedling.—A soft apple, of little flavour at time of Conference. Possibly an early variety, and of better flavour when properly ripe.

A. J. Thompson, Pennant Hills, submitted two seedling apples. To be reported on in 1918.

Red seedling apple, from R. D. Best, of Tanmangaroo.—Mr. Chilton reports, "It beats all varieties as a long-keeping apple." It is grown in a cold district; the flavour is fair, and would be possibly much better later on. It is of good appearance, and has good possibilities.

"Tasmanian Beauty," wrongly shown last year as "Australian Beauty".—It has a fine and bright colour, and a small core, keeps well, flavour good. Is a seedling of Alexander, a mid-season apple, whose high colour would commend it anywhere. Name changed to "Huon."

T. J. Rowe, of Cradoc (Huon), submitted a seedling apple of firm and crisp flesh, very juicy, the stems long, of red colour on sunny side.

J. H. Waldron, of Wyena, submitted a seedling apple, reported as "perfectly blight-proof."

Mrs. J. Beal, of Varna, Lorne, submitted a seedling apple. It was very large, and of good appearance and flavour; reported to be a heavy cropper.

"Lang's Seedling".—From James Lang, Harcourt. A very good-coloured apple, of late season.

"Herbert's Red Rome".—A sport from Rome Beauty, submitted by Andrew Herbert, of Diamond Creek. Identical with Rome Beauty, except that the colour is of uniform dark-crimson, and darker than Glengyle.

"Clerome".—Apple raised by A. V. Robin, of Nuriootpa, as a cross between Rome Beauty and Cleopatra. It blossoms after Cleopatra, is a regular cropper, and possesses good-keeping qualities; is ready to pick in early February, and is good for shipping. Its freedom from bitter pit is marked. Cleopatra, in its season, is the better apple, but the advantage of Clerome is its earliness for shipping. It is more resistant to fusicladium than Cleopatra. It was tested at Bathurst—which is quite a different district from Nuriootpa—and discarded. Nuriootpa is a warm district, with 21 inches of rainfall. The Committee invites information from the different States before finally recommending it as an export apple.

"Beauty of Australia".—A chance seedling which appeared in the garden of R. Bonython, of Summertown, near Mount Lofty, forty years ago. It is a good keeper, with a fine colour; takes woolly aphis, but not very subject to bitter pit. This variety will keep till August, and has been shipped to England. Is recommended only for local market.

A. B. Robin submitted two apples:—(*a*) "Jonathan x Cleopatra"; and (*b*) "Jonathan x London Pippin." Both were recommended for detailed report next year.

F. A. Joyner, Bridgewater, submitted a seedling apple, possibly from Nickajack. The specimens were not sufficiently indicative of

what the possible quality might be later, but it seemed to be a promising seedling.

Mr. Peck, of Balhannah, submitted a seedling apple raised by Peck, of Williamstown, known variously as Barossa Seedling, Barossa Beauty, and Peck's Seedling. It keeps well in cool storage, and comes out of the stores in August with a better flavour than Rome Beauty.

Mr. John Wren, of Houghton, submitted an apple seedling of good possibilities.

PEARS.

"Judd's Beurre".—A late pear, of good flavour; the "Beurre" to be dropped.

"Late Umlauff".—Sent by A. B. Robin, and raised by Umlauff from imported seed. Profitable with Mr. Robin on account of its long-keeping qualities; picked in April, and ripe in August-September after being kept in fruit house; very resistant to fusicladium; quality only medium for dessert; may probably be of use as a good stewing pear.

A. B. Robin submitted two seedling pears:—(*a*) "Late Umlauff x Beurre Clairgean" (like Beurre Superfin); and (*b*) "Josephine x Forelle," a very handsome pear.

Revision of Names.

"Dunns".—Dunn's Favourite to be known in future as Dunns.

"Esopus".—Esopus Spitzenberg, conforming to American custom, to be known as Esopus.

"Wolseley".—Lord Wolseley to be known as Wolseley.

"McIntosh".—McIntosh Red to be known as McIntosh.

Additional Reports.

The following reports on previously approved seedlings were received:—

APPLES.

"Trevitt".—This name is incorrectly spelt as Trevett in the 1917 report.

"Prince Alfred" apples does not thrive in warm climates; is a very good cooker, and, being large, is more used for dressing shop windows than for export, although it is occasionally shipped to England. Mr. Shoobridge reported that he had seen twenty apples fill a bushel case. It is not recommended for extensive planting.

"Statesman" apple.—It is not favoured in New South Wales, where it is reputed to have no flavour; is not grown in South Australia. It is well and frequently grown in Victoria, where it has a good flavour. Will keep well. Grown extensively in Tasmania, does well, and is well-flavoured. Mr. Thiele reported that it never depreciates in value after being in cool storage, and is quite crisp when it comes out. Does not colour very well in any of the States.

"Ranelagh" apple.—Considered to have good commercial possibilities; reported to be free from black spot.

"Tasma" apple.—Some nurserymen are still wrongly calling this apple Democrat. Keeps well in Tasmania out of cold storage till October. It is doing well in Adelaide.

"Crofton" apple is very subject to black spot, and inclined to deteriorate in size, is a good keeper, and sells well in October.

"Duke of Clarence" apple.—A good early apple for local markets; well known in Tasmania; is a heavy cropper. It is too soft for general commercial purposes, very subject to black spot, and slightly resistant to woolly aphis. Mr. Shoobridge reports that Worcester Pearmain is much better for early shipments, as Duke of Clarence is not received with favour in England, owing to insufficient flavour.

Pears.

"Giblins Nelis".—To be known as Giblins. Exceptionally well known on Tasmanian markets. A good pear. Has been grown in Tasmania for over fifty years.

"Laffer".—Found by the Chairman, Mr. G. R. Laffer, in the National Park, South Australia, in 1892; blossoms about the same time as Williams; even, and regular in cropping; ripens at the end of February, or in March, following Williams; keeps several weeks in ordinary cellar; generally sought after by purchasers each year; texture is melting, quality rich, sweet, and aromatic. Mr. Wicks reports, "A first-quality pear when in good condition." Is of value for local market, and not for export.

"Corona."—From A. B. Robin. Late Umlauff ex Beurre Clairgean. The tree is twelve years old. Fruit picked at end of March, and ripens a month later. Mr. Wicks considered it one of the best seedlings presented. It is smooth, of good colour and quality; comes later than Beurre Bosc; is not good for wet situations, preferring dry soils; it may possibly stand dry and hot climatic conditions; its canning possibilities are not yet known.

Peach.

Samples of a good late peach were submitted by R. D. Best, of Tanmangaroo. They were identified as "Sonter's Late Slip." It is a free stone, of yellowish flesh, and red near the stone. Mr. Savage reported it as the best late white slip at Blackwood.

Plum.

Samples were submitted by Mr. Beaumont, of Adelaide, from an old tree grown at Mile End. A reddish-blue plum, with heavy bloom; fine, and late, but rather coarse for jam; stone small; fruit ripe at end of April. It is possibly a seedling, as the suckers round the tree were bearing identical fruit with the old tree. The Committee considered it a good variety, owing to its lateness and good quality, and asked for a report in 1919.

Rejections.

The following apples were rejected by the Committee, either because they showed no attributes which would be likely to recommend them commercially, or because there are many other fruits of better quality which are marketable at the same period of ripening:—Vicary's Eating Apple, Vickery's Beauty, Niggerhead, Goulburn Beauty, Gravenstein Seedling (W. Woodyatt, Kembla Vale), seedling from Mr. Egginton of Cardiff; Mountain Pippin, Peck's Seedling, Red Five Crown (R. D. Best, Tanmangaroo), Scarlet Five Crown Seedling (F. Charles),

Seedling No. 2 (R. D. Best), Seedling (G. A. Jones), Baker's Success, Wyena Pippin (blightproof), Hatherly Pearmain (J. H. Waldron, Wyena), Seedling (B. S. Hall, Launceston), Cheltenham Pippin, Garibaldi, Alfred Ross (Houghton), Yellow Seedling (Houghton), Seedling from Dunns (Halliday, Aldgate), Seedling Nos. 1, 3, and 4 (F. A. Joyner, Bridgewater), Seedling from Dumelow (Jenkins, Forest Range), Lady Daly.

GENERAL RESOLUTIONS CARRIED.

(A) It having been announced that the Government Officer of Tasmania (Mr. J. N. Ward) was being despatched to the Western States of America to collect information on fruit-growing, the following motions were passed:—

(1) "That this Committee records with pleasure the action of the Tasmanian Minister of Agriculture in deciding to send to America one of its members, Mr. J. N. Ward, in order to study and report on the fruit industry in all its phases. The Committee trusts that Mr. Ward will take advantage of and visit all the Experiment Stations possible, so that American and Australian methods may be compared."

(2) "That a letter of introduction from the Committee be supplied to Mr. Ward, signed by the President and Secretary."

(B) "That it be a recommendation to the various State Departments that the Committee's list, as compiled, be distributed to the various nurserymen and growers in all the States, inviting their co-operation in the standardizing of fruit names."

(C) "That the Committee offers an expression of appreciation of the welcome afforded by the South Australian Department of Agriculture, and of the very able assistance given by all of its officers."

SUBJECTS FOR DISCUSSION FOR 1919.

(1) The despatch of a delegation from the Committee by the Commonwealth, to fully study American methods of growing, and systems of Pomology.

(2) Peaches and Plums for canning.

(3) Blight-proof Apples and Stocks.

The 1919 meeting will be held at Hobart, in Tasmania, in autumn, when it is anticipated that a large Inter-State Fruit Show will be held.

LIST OF APPROVED NAMES TO DATE.

Apples.

Adopted and Correct Name. *Synonyms in parentheses.*	Synonyms and Misnomers.
Adam's Pearmain	Erroneously called Golden Reinette and Dutch Mignonne in Tasmania.
Aiken	Aiken's Seedling.
Alexander	Emperor Alexander.
Alfriston.	

Adopted and Correct Name. *Synonyms in parentheses.*	Synonyms and Misnomers.
(Apple of Snow), *see* Fameuse.	
(Ballarat), *see* Stewart's.	
Beauty of Bath.	
Ben Davis.	
Bismarck	Prince Bismarck.
Champion.	
Cleopatra	Ortley, New York Pippin.
Clerome.	
Cowell	Cowal's Red Streak.
Cox's Orange Pippin	Known as Cox's Orange in America.
(Croton), *see* Ranelagh.	
(Carpenter), *see* Gravenstein.	
Duke of Clarence.	
(Democrat), *see* Tasma.	
Dumelow	Dumelow's Seedling. Wellington.
Dunn's	Dunn's Seedling, Munroe's Favourite, Dunn's Favourite.
Dunolly	Mellon's Seedling.
Esopus	Esopus Spitzenberg.
(Emperor Alexander). *see* Alexander	
Fameuse	Pomme de Neige, Apple of Snow, erroneously, in New South Wales, Snowy, Fanny.
(Five Crown), *see* London Pippin.	
French Crab.	
Gascoigne's Scarlet.	
Glengyle	Glengyle Red.
Goondarin	Brown's Pippin.
Gowar	Yeate's Nonpareil.
Granny Smith.	
Gravenstein	Carpenter, and other names, in parts of New South Wales.
Hornsby.	
Huon	Tasmanian Beauty.
Jonathan.	
King of Pippins	King of the Pippins, erroneously known as Golden Reinette and Adam's Pearmain, and in Tasmania as Summer Pearmain.
Lady Daly.	
Lady Hopetoun.	
Lane's Prince Albert.	
Lang's Best.	
London Pippin	Five Crown.
Lord Suffield.	
Maiden's Blush.	
McIntosh	McIntosh Red.

Adopted and Correct Name. *Synonyms in parentheses.*	Synonyms and Misnomers.
(Munroe's Favourite), *see* Dunn's.	
(Mellon's Seedling), *see* Dunolly.	
(New York Pippin), *see* Cleopatra.	
Peasgood's Nonsuch.	
Perfection	Shepherd's Perfection.
(Pomme de Neige), *see* Fameuse.	
(Prince Bismarck), *see* Bismarck.	
Prince Alfred.	
Ranelagh	Croton.
Reinette de Canada	Erroneously known in Tasmania as Blenheim Orange.
Rokewood.	
Rome Beauty.	
Rymer.	
Scarlet Nonpareil	Erroneously known as Scarlet Pearmain in Tasmania.
Schroeder	Schroeder Apfel.
Shorland Queen.	
Statesman.	
Stayman Winesap.	
Stewarts	Stewart's Seedling, Ballarat.
Stone Pippin	Winter Pearmain.
(Snowy), *see* Fameuse.	
Tasma	Democrat. The name has been changed to Tasma because of the existence of two American apples under the name of Democrat.
Tasman's Pride.	
Trevitt	Trivett's Seedling.
Twenty Ounce.	
Wagener.	
Warner's King.	
Wealthy.	
(Wellington), *see* Dumelow.	
Winter Strawberry.	
Wolseley	Lord Wolseley.
Worcester Pearmain.	
(Winter Pearmain), *see* Stone Pippin.	
Yapeen	Yapeen Seedling.
Yates.	
(Yeate's Nonpareil), *see* Gowar.	

The following names have been misused in various parts of Australia, but cannot be included in the alphabetical lists of synonyms, as they are the names of distinct varieties of apples:—

(Dutch Mignonne) *see* Adam's Pearmain; (Fanny) *see* Fameuse; (Golden Reinette) *see* Adam's Pearmain and King of Pippins; (Scarlet Pearmain) *see* Scarlet Nonpareil.

PEARS.

Adopted and Correct Name. *Synonyms in parentheses.*	Synonyms and Misnomers.
Beurre Bose.	
Beurre Capiaumont.	
Beurre D'Anjou.	
Beurre Diel.	
Beurre Superfin.	
(Bartlett), *see* Williams.	
Clapp's Favourite.	
Conference.	
Corona.	
Doyenne du Comice.	
(Duchess), *see* Williams.	
Duchess D'Angouleme.	
Durondeau.	
Elizabeth Cole.	
Giblin	Giblin's Seedling. Giblin's Nelis.
Glou Morceau.	
Harrington	Formerly Harrington's, Victoria.
Howell.	
Josephine de Malines.	
Kieffer	Kieffer's Hybrid, Keiffer's Hybrid.
Laffer	Laffer's Nelis, Laffer's Bergamot, Laffer's Seedling.
Le Lectier.	
Madame Cole.	
(Napoleon), *see* Vicar of Winkfield.	
Packham's Late.	
Packham's Triumph.	
Thompson's.	
Urbaniste.	
Vicar of Winkfield	Napoleon.
Williams	Williams' Bon Chretien, Bartlett, Duchess.
Winter Cole.	
Winter Nelis.	

NOXIOUS WEEDS.

List of Plants Proclaimed under the Thistle Act for the State of Victoria.

Scientific Name.	Common Name.	Date of Proclamation, &c.	Date Gazetted.
Carduus arvensis	Perennial Californian Thistle	Sec. 3 Act 2736	
Carduus benedictus	Sacred Thistle	,,	
Carduus lanceolatus ..	Spear Thistle	,,	
Carduus Marianus	Spotted Thistle	,,	
Onopordon acanthium ..	Scotch Thistle	,,	
Xanthium spinosum ..	Bathurst Burr	,,	
Brassica Sinapistrum ..	Charlock or Wild Mustard ..	23.10.06	31.10.06
Carduus pycnocephalus ..	Shore Thistle	16.2.92	19.2.92
Centaurea calcitrapa ..	Star Thistle	,,	,,
Centaurea melitensis ..	Malta Thistle	,,	,,
Centaurea solstitialis ..	St. Barnaby's Thistle ..	18.1.08	29.1.08
Conium maculatum	Hemlock, Wild Parsnip, or Wild Carrot	7.5.07	15.5.07
Convolvulus arvensis ..	Common Bindweed ..	10.6.08	17.6.08
Cuscuta	Any plant named Dodder ..	20.10.11	25.10.11
Cuscuta epithymum ..	European Dodder	10.6.08	17.6.08
Cyperus rotundus	Nut Grass	8.9.92	16.9.92
Datura Stramonium ..	Thorn Apple	18.6.07	26.6.07
Erechthites quadridentata ..	Cotton Weed	11.4.10	20.4.10
Echium violaceum	Paterson's Curse or Purple Bugloss	3.2.11	15.2.11
Gilia squarrosa	Californian Stink Weed, Digger's Weed, or Sheep's Weed	12.3.07 21.5.07	20.3.07 29.5.07
Homeria collina	Cape Tulip	16.9.02	24.9.02
Hypericum androsaemum ..	The Tutsan	26.6.17	4.7.17
Hypericum perforatum ..	St. John's Wort	6.8.03	12.8.03
Inula graveolens	Stinkwort	5.4.92	8.4.92
Kentrophyllum lanatum ..	Saffron Thistle	16.2.92	19.2.92
Loranthus celastroides .. *Loranthus pendulus* ..	Mistletoes	24.10.04	2.11.04
Lycium horridum	Box Thorn	9.4.07	17.4.07
Myagrum perfoliatum ..	Musk Weed	27.2.13	5.3.13
Opuntia monacantha ..	Drooping Prickly Pear ..	6.2.07	13.2.07
Pontederia crassipes ..	Water Hyacinth	8.10.01	16.10.01
Raphanus Raphanistrum ..	Wild Radish or Jointed Charlock	12.11.12	20.11.12
Romulea cruciata	Guildford Grass or Onion Grass	30.7.07	7.8.07
Rosa rubiginosa	Sweet Briar	,,	,,
Rubus fruticosus	Blackberry Bramble ..	18.1.08	29.1.08
Senecio Jacobaea	Ragwort	7.7.14	15.7.14
Solanum sodomaeum ..	Apple of Sodom or Kangaroo Apple	6.2.07	13.2.07
Ulex europaeus	Furze	18.1.08	29.1.08

List of Plants Proclaimed under the Thistle Act for Certain Municipalities in Victoria.

Scientific Name.	Common Name.	Municipality to which Proclamation Applies.	Date of Proclamation	Date Gazetted.
Asphodelus fistulosus	Onion Weed ..	Queenscliff ..	21.10.95	24.10.95
		Bellarine ..	16.11.96	20.11.96
		South Barwon ..	6.9.97	10.9.97
		Port Fairy ..	6.8.03	12.8.03
		Swan Hill ..	8.11.05	15.11.05
		Maldon ..	18.1.08	29.1.08
		Warrnambool (Town) ..	21.10.13	29.10.13
		Flinders ..	30.11.15	8.12.15
		Warrnambool (Shire) ..	23.12.15	29.12.15
		Karkarooc ..	26.2.18	6.3.18
Acacia armata ..	Acacia Hedge or Prickly Acacia	Portland ..	20.10.96	23.10.96
		Mornington ..	12.1.97	15.1.97
		Dundas ..	2.4.97	9.4.97
		Frankston and Hastings	31.5.98	3.6.98
		Portland (Borough)	6.2.99	10.2.99
		Hamilton (Borough) ..	25.2.04	2.3.04
		Maldon ..	18.1.08	29.1.08
		Stawell ..	14.12.09	22.12.09
		Flinders and Kangerong	30.6.13	9.7.13
		Kowree ..	12.3.18	20.3.18
Anthemis Cotula ..	Stinking Mayweed or Fetid Chamomile	Orbost ..	26.3.07	5.4.07
		Maldon ..	18.1.08	29.1.08
		Bairnsdale ..	21.2.11	1.3.11
Andropogon halepensis	Johnson Grass ..	Mildura ..	28.9.14	7.10.14
Cassinia arcuata ..	Chinese Scrub ..	Waranga ..	4.6.94	8.6.94
		Maldon ..	18.1.08	29.1.08
Cytisus canariensis ..	Cape Broom ..	Kyneton ..	17.4.96	24.4.96
		Malmsbury ..	10.4.99	14.4.99
		Kilmore ..	8.10.00	19.10.00
		Creswick ..	31.7.00	3.8.00
		Heidelberg ..	9.9.01	18.9.01
		Lilydale ..	4.11.01	13.11.01
		Glenlyon ..	8.7.02	23.7.02
		Lexton ..	19.8.02	27.8.02
		Springfield ..	25.2.04	2.3.04
		Bungaree ..	21.2.07	27.2.07
		Templestowe ..	30.7.07	7.8.07
		Maldon ..	18.1.08	29.1.08
		Newham and Woodend	26.6.17	4.7.17
Cryptostemma calendulaceum	Cape Weed ..	Poowong and Jeetho	28.6.01	12.7.01
		Maldon ..	18.1.08	29.1.08
Cytisus scoparius ..	English Broom ..	Glenlyon ..	8.7.02	23.7.02
		Maldon ..	18.1.08	29.1.08
Cucumis myriocarpus	Gooseberry Cucumber	Towong ..	4.8.08	12.8.08
Erysimum repandum	Treacle Mustard ..	Wimmera ..	20.12.00	28.12.00
Emex australis ..	Spiny Emex, Three-cornered Jack, or Cat's Head	Bellarine ..	13.2.17	21.2.17
		South Barwon ..	19.6.17	27.6.17

List of Plants Proclaimed under the Thistle Act for Certain Municipalities in Victoria—*continued.*

Scientific Name.	Common Name.	Municipality to which Proclamation Applies.	Date of Proclamation	Date Gazetted.
Lepidium Draba ..	Hoary Cress ..	Dunmunkle ..	14.12.15	22.12.15
Marrubium vulgare	Common Horehound	Warrnambool (Shire) ..	22.1.06	31.1.06
		Maldon ..	18.1.08	29.1.08
Madia sativa ..	Pitch Weed ..	Violet Town ..	9.4.07	17.4.07
		Maldon ..	18.1.08	29.1.08
Phytolacca octandra	Red Ink Plant or Dye Berry	Melton ..	18.9.17	26.9.17
		Werribee ..	,,	,,
Reseda Luteola ..	The Weld or Wild Mignonette or Dyer's Weed	Melton.. ..	20.3.17	28.3.17
		Bacchus Marsh ..	,,	,,
Rumex conglomeratus	Clustered Dock ..	Heidelberg ..	23.4.18	1.5.18
Rumex crispus ..	Curled Dock ..	,, ..	,,	,,
Rumex obtusifolius ..	Broad-leaved Dock	,, ..	,,	,,
Rumex pulcher ..	Fiddle Dock ..	,, ..	,,	,,
Salvia verbenaca ..	Wild Sage ..	Warrnambool (Shire) ..	22.11.09	1.12.09
		Wimmera	11.12.17 22.1.18	19.12.17 30.1.18

HINTS ON FLAX CULTIVATION WHEN GROWN FOR BOTH FIBRE AND SEED.

(*Linum Usitatissimum.*)

In view of the many inquiries recently received regarding flax cultivation, it is considered advisable to give for the present a few brief hints that may serve as a general guide to those not having previously grown the crop, and to deal more fully with the subject at a later date. If, however, in the meantime, further information is required, it may be obtained from the Department of Agriculture or through the Secretary of the Commonwealth Fax Committee.

Soil and Situation.

Flax is a hardy plant, and, given good and clean land, will thrive under varying conditions, but it prefers a well-drained, free, loamy or chocolate soil, preferably fallowed in a warm situation and a showery spring. Generally speaking, it may be expected to give satisfactory returns when grown under conditions that should produce a heavy crop of oaten hay.

Sowing.

Experience proves the best time for sowing flax in Gippsland to be from the middle of April to the middle of May, though this may be varied somewhat according to locality and situation, but early seeding is advisable, the object being to have the plants well established before winter. The soil should be worked to a fine tilth. The seed should be sown at the rate of about 60 lb. per acre, and may be either drilled in or broadcasted, but preferably the latter, and then lightly harrowed and rolled.

Manure.

Manure should be used rather more freely than for a cereal crop, either bone or bone and super. being applied in equal proportions.

Weeding.

The land selected should be clean, and if strong-growing weeds, such as thistle, dock, wild turnip, radish or fern, &c., appear, they must be cut or pulled at the most suitable time; this is necessary, for they not only occupy space that should be growing flax, but give trouble in the after treatment.

Harvesting.

The crop should not be allowed to fully mature. It is ready for harvesting when most of the seed bolls have turned brown, though a few of the lower ones may be more or less green. The stems at this stage are usually, but not necessarily, of a golden colour, with the lower portion of the foliage dropping off.

The crop should be cut as near the ground as possible, because the stems carry fibre right to the surface, and if long stubble be left much fibre is wasted. Another advantage is that cutting low makes the work easier. The cutting parts of the reaper and binder should be in perfect order, and plain blades are preferable to serrated.

Sheaves should be small, as in this form they are much more readily threshed than when large. They should be stood in long stooks (not round), and stacked when ready, as unduly long exposure in the paddock is objectionable.

Note.—When the object is a crop of seed only, a thinner sowing is advisable, and the crop should be allowed to mature.

NOTES ON CARE OF HORSES DURING AUGUST.

The feeding and general management of horses recommended for July will also apply for this month. Horses, more especially young ones, running on low-lying country are liable to become affected with internal parasites. This will be recognised by the unthrifty and poor condition of the animals; in such cases medicinal treatment will be necessary. If the following lick be made available, it will not only be of great assistance in preventing serious invasion, but in cases where worms are not in large numbers, the repulsion of them from the intestinal tract will result:—

Lick.

20 parts salt.
10 do. lime.
1 do. sulphate of iron.

If possible, be with mares at foaling, so that the navel cord may be properly tied and thoroughly treated with antiseptic, and thus prevent that very fatal disease, navel or joint ill. Wash cord with one part of corrosive sublimate to 3,000 of water, and soon after paint with tincture of iodine. The iodine treatment must continue till the cord has completely dried up.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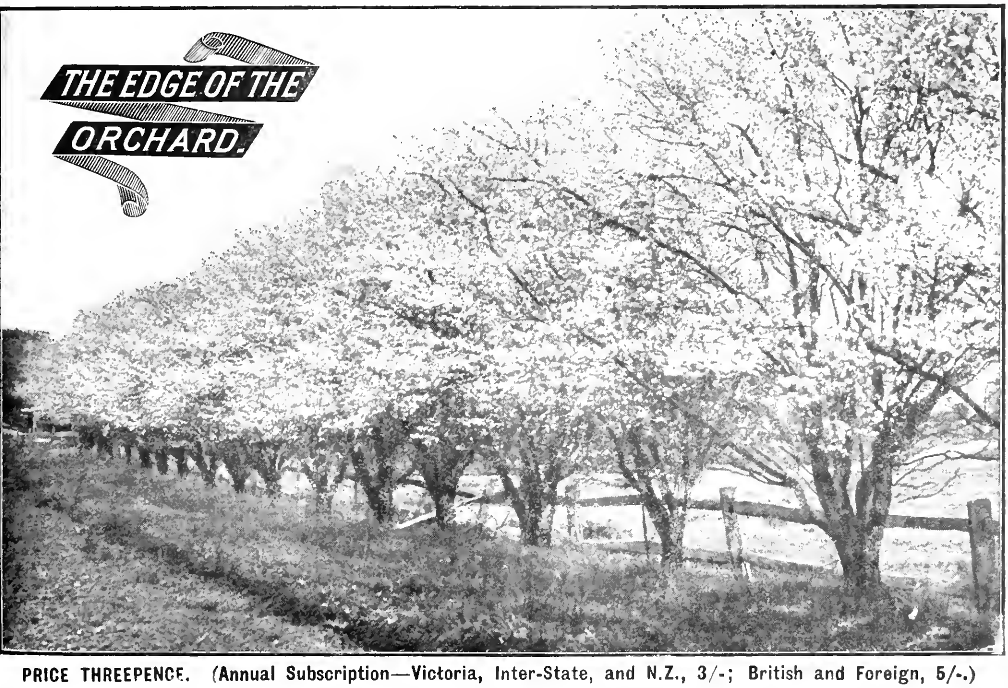
August, 1918.



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THE JOURNAL

OF

THE DEPARTMENT OF AGRICULTURE,

VICTORIA, AUSTRALIA.

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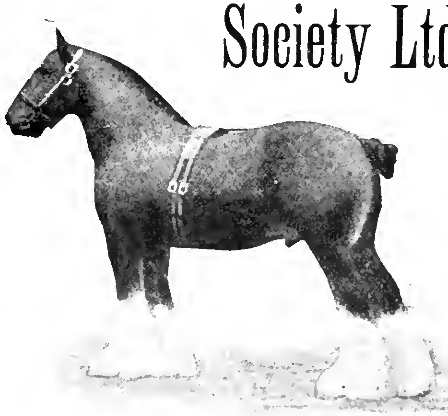


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TABLOIDING OF PRIMARY PRODUCTS.*

By R. Crowe, Exports Superintendent.

Upon receiving a request from the Secretary of the Chamber of Agriculture to prepare a paper on this subject, I called to mind the picture on the railway hoardings of the tearful bullock sniffing the diminutive bottle of bovril with the superscription, "Alas! my poor brother." I recognised that it was a most appropriate subject for discussion at the present time, and being quite unfettered by any suggestion as to the method of approaching the question, I have dealt with it in my own way.

Primary produce is accumulating in Australia and New Zealand. The shipping outlook is not wholly satisfactory, and, although some people say that we have been singularly fortunate, so far, in getting away nearly all our dairy produce and meat, I can only partially support that view. If Australia has been able to send overseas most of its frozen meat, it is because the quantity for export has been small. Surely it would have been far better for every one if we had enjoyed such a good run of seasons as New Zealand has had—so good, in fact, as to have given us an "embarrassment of riches." Whilst, during the last three years, the Dominion of New Zealand has received millions for meat and dairy produce, Australia has been occupied in building up her flocks and herds. Now that our stock is again reaching normal numbers, there is certain to be large surpluses for oversea shipment before the end of the present year, and perishable produce may accumulate in the same manner, but, of course, not to the same extent as wheat and wool. I purpose dealing with the matter chiefly from the shipping point of view, and to refer briefly to the staple primary products.

Wool.

Some time since, when the scarcity of shipping began to be felt, those interested in wool took steps to get as many bales as possible into a ship.

* Paper read at the Annual Convention of the Chamber of Agriculture, July, 1918.

A committee was formed which carried out some experiments, and succeeded in reducing the space to be occupied by each bale. Two bales of dumped wool were put together and double-dumped, with the result that each cubic foot of space carried 25.3 lbs. of greasy wool against 20 lbs. to the foot, and 18.8 lbs. of scoured wool against 16.2 lbs. when only single-dumping was the practice. In other words, with double-dumping, a bale of greasy wool measured 13 ft. 4 in. instead of 17 ft. 3 in., and a bale of scoured wool occupied 13 ft. 6 in. where previously 17 ft. 5 in. of space was taken up. This means a saving of 4 cubic feet for each bale, or about 10 per cent. Thus nine steamers will now carry as much wool as ten did formerly. You will recognise that this achievement is an equivalent to the building of new ships, and is calculated to largely help in circumventing the depredations of the enemy.

If the chief woollen goods required for our own use were manufactured here the whole of the shipping space required for wool sent to oversea destinations to be woven and then returned to Australia, could be saved by the manufacture of certain articles in our own country. There is no reason why the leading products of wool could not be wholly made up in Australia. Blankets, flannels, tweeds, and such like should, in the near future, have no place in our imports. Owing to the war, increased attention has been given to the manufacture of our own goods, and the present output is limited owing to the difficulty of getting increased machinery. This, however, should be remedied in good time. As the operations are proving very profitable, there appears no good reason why some of the present mills should continue working only one shift a day. The turnover, in some instances, could be doubled and trebled by increasing the shifts, and overhead expenses per yard of material produced thus considerably reduced, and all sections of the community benefited. All our mills are working night and day, and are proving very profitable. The industry is one that lends itself to adaptation in country centres, as is illustrated by its success at Ballarat, Geelong, Castlemaine, and Warrnambool. Some large firms have successfully developed certain branches of this industry, and it is rumoured that others are to follow. The quantity of wool used locally for manufacturing purposes from 1907 to 1913 ranged between five and six million pounds weight, and for 1915 it exceeded 11,000,000 lbs.

Wheat.

In the *Journal of the Department of Agriculture* for August, 1917, an excellent article appeared on the "Milling and Baking Qualities of Australian Wheat," by Mr. Scott, Chemist for Agriculture, and Mr. Winslow, Milling Expert. In that article it was shown that, in Australia, 2,814,008 tons of wheat were then available for shipment, and this quantity gristed would, on a 70 per cent. flour basis, return 1,868,713 tons. Taking the carrying capacity of the ships engaged in the transport of wheat at approximately 4,500 tons, the number of shiploads required to transport the wheat would total, in round figures, 625, while if the wheat were milled here, and the flour exported, shipping would be reduced by one-third, for the flour could be transported in 415 cargoes. They pointed out that, besides the immense saving in

shipping and the increase in local industry, there would be a further gain, if all our wheat were milled in the Commonwealth, by the retention of wheat offals, screenings, &c., which could be profitably used here. The writers gave illustrations showing that the bran, pollard, &c., represented 178 shiploads; the screenings, *i.e.,* the cracked and shrivelled grain, 27 shiploads; and impurities, such as oats, barley, chaff, &c., 5 shiploads, making a total of 210 shipments that could be saved. Whilst the impracticability of milling the whole of the wheat here is quite apparent, it is obvious that everything possible should be accomplished under this heading. It was gratifying to learn from the Minister of Agriculture yesterday that he was arranging for as much of our wheat as possible to be milled for export.

Maize.

During the last few years much has been accomplished in the tabloiding of maize by the Maize Products Company, which has built up a huge business by extracting oil and oil meal from the germ of the grain, while, from the grain, starch is derived, which in turn is converted into glucose, block glucose, cornflour, and laundry starch. Furthermore, gluten is produced, and bran, or cow feed. This one company is prepared to treat three times the present maize production of Victoria, and some idea may be gained of its operations when it is stated that last month the Produce Division of the Department of Agriculture inspected 34,000 bags imported by this firm from Queensland and New South Wales. The price which the company gives is a profitable one for the grower, and there is no reason why the production of maize in the State should not be very materially increased.

Meat.

Those intrusted with the shipment of meat conceived the idea that, by cutting carcasses of sheep across the middle, and utilizing the forehalf as an envelope for the hind-quarters, they could be packed so as to occupy smaller shipping space. As very little export business has been done by Victoria since this discovery, information regarding results is quoted from another source. In the May number of the *Pastoral Review,* 1918, the following appears:—

> "Sir Owen Cox, Managing Director, Birt and Company Limited, who is chiefly instrumental in bringing about the development, has now shown us the result of several shipments. All these prove what was claimed as a fact, that is, a saving of from 33 per cent. to 38 per cent. in the storage has been successfully carried out, or, in other words, two refrigerated steamers can now carry what three did before. This, without doubt, is the most valuable work that has been accomplished during the war in any Department outside actual war work. Sir Owen Cox and others who have brought this about deserve the thanks of not only the whole pastoral community of the world, but also the consumers of meat in Great Britain and Europe."

Rabbits.

Somewhat similar results have been accomplished in the rabbit export trade. Last year, 1,556,209 crates, containing 37,349,016 rabbits, were

packed in Australia for export, and these required 61,488 tons of shipping space. I suppose it was because the hospital authorities in England and France found it difficult to utilize the skins, and desired to be rid of the work of skinning rabbits, that the Imperial authorities this year at first refused to enter into fresh contracts. Eventually, however, they agreed to accept skinned rabbits. With the removal of the heads, paws, and skins, more carcasses are packed for shipment in a crate of reduced size, so that one steamer will now carry nearly as many rabbits as two did formerly. Had the present arrangements obtained last year, the rabbits exported would have occupied 36,616 tons of space, and thus a saving of 25,072 tons, or roughly, 46½ per cent., would have been effected.

Fruit.

Perhaps it will be with fruit that most will have to be done in the direction of tabloiding. In every house dried fruit, in the shape of currants, raisins, and sultanas are required. The drying of grapes and currants brings about a reduction in the original bulk of about 66 per cent., varying, of course, according to the variety and degree of ripeness, &c. Apricots and peaches show a still larger reduction—80 per cent. to 85 per cent.—pears, about 78 per cent; and now more attention is being given to the drying of apples, in the case of which the reduction in bulk is in the neighbourhood of 85 per cent., this larger percentage being partly in consequence of the removal of the skins and cores. It is interesting to recall that last year arrangements were made in Tasmania for the drying of 1,000,000 cases of apples. Some attention has also been given to this industry in our own State.

Sugar Beet.

This product is nearest on the list towards meriting the title of this paper. It takes about 8 tons of sugar beet to produce one ton of sugar, and the success achieved in that industry augurs well for its future.

Dairy Produce.

With the tabloiding of dairy produce every one is familiar. By means of the dairy cow grass, herbage and fodder are turned into milk, and subsequently butter and cheese are produced, butter fat representing less than 4 per cent., and commercial butter about 4½ per cent. of the milk, whilst cheese represents roughly 10 per cent. During recent years great development has taken place in the production of condensed and concentrated milk, dried milk, and casein. The production of concentrated and powdered milk in Victoria in 1910 was 3,004,842 lbs., and for the year 1916-17, 33,280,635 lbs.—more than a tenfold increase, in addition to which 467,168 lbs. of casein was made. For the first seven months of the financial year just closed the Produce Division of the Department of Agriculture inspected for oversea shipment 291,213 cases of condensed milk, and 15,484 cases of dried milk. This quantity was produced in addition to supplying local requirements; and it will be realized that the conversion of milk into the form that enables it to be kept for a long time and transported over dis-

tances naturally increases its consumption, as it is thus brought within the reach of a large number of people who otherwise would have to do without it. This comment is also applicable to fruit.

Conclusion.

Whilst the time allowed for the address precludes me from dealing with this subject exhaustively or scientifically, I hope sufficient has been stated to show the possibilities and the necessity for the tabloiding of primary products. You will have seen what has been accomplished during recent years, and will recognise that the war has already done something in the direction of making Australia more resourceful and self-supporting. You will also realize, as I do, that each product touched upon, and others which have not been mentioned at all, could easily form the subject of a lengthy discourse by itself. However, if I have simply lifted the screen, so to speak, to enable a glance to be taken of the present position, and the way in which those concerned are endeavouring to meet contingencies as they arise, I shall be satisfied.

DESTROYING CALIFORNIAN THISTLE.

A particular method of destroying patches of Californian thistle with straw has been practised by certain farmers in South Canterbury for a number of years past, but does not appear to be so generally known as its merit warrants. Under this system the patch is well covered, in autumn, with straw to a depth of about 1 foot. In spring the thistle comes through the covering in spindly whitish shoots. The straw is then turned with a fork, this operation breaking off the shoots. An alternative, and perhaps rather more thorough, plan is to pull the shoots with the hand, gloved. Either method can be repeated as necessary. Patches have often been killed out in one year by this system, but, if necessary, the treatment can be continued for another season. The straw in due course rots, and makes good manure for the ground. As with all other farm operations, careful attention must be given to manipulating the thistle patches under treatment. Dumping down the straw, and doing little or nothing further is practically waste of time. The principle of the system is not immediate smothering, but inducing a struggling weakly growth which exhausts the plant, the killing process being furthered by the breaking of the shoots. Where straw is not available, fern or other material, such as gorse clippings, might be used for the same purpose. The originator of the method described appears to have been Mr. A. Clelland, now resident in Timaru, who completely cleared his farm at Cave of the thistle ten or twelve years ago. It may be added that Mr. Clelland had previously tried to destroy the thistle patches by the application of salt, but with very ill effect on the soil, the land being what is colloquially termed "tarry" limestone country, which sets hard when liberally dosed with salt.—[*New Zealand Journal of Agriculture,* June, 1918.]

APPLE CULTURE IN VICTORIA.

By J. Farrell, Orchard Supervisor.

(Continued from p. 363.)

The Dam System of Irrigation.

It has been previously stated that, although good results attend the channel system in the north, relatively better returns in apple production would follow the more general adoption of the dam system of irrigation than accrue from the rather limited application of water by this means at present obtaining in the southern fruit areas. This calculation is based on the fact that apple trees, when cultivated in the cooler undulating fruit districts occupying the central and southern portions of the State, thrive better and yield heavier crops of higher quality fruit than those grown on the flat lands of the warmer northern districts.

Orchardists in districts unsuitable for channel schemes, who realize the advantages to be derived from watering their trees, especially during seasons of light summer rainfall, now resort to the dam system of irrigation. The conditions militating against channel systems arise from the serious irregular undulations in the physical features of those districts, the absence of natural permanent streams and the consequent lack of regular supply. Fortunately, however, the usually copious winter rains experienced in such places are ample, when systematically accumulated and carefully stored, to supply the normal irrigation requirements of local orchardists during summer.

Dam and Reservoir Construction, Water Accumulation and Storage.

In selecting the site for a dam from which to irrigate by gravitation, care should be taken that it be placed at a level high enough to command the whole of the area to be watered. The ground chosen for the excavation and to form the embankment should be of a retentive character so as to prevent the escape of any of the accumulated water by seepage. Mistakes are often made through constructing dams in porous clays. Not alone is the orchardist thus deprived of the use of the water during summer, but the trees below the dam suffer from the seepage.

Provided the soil on any part of a main slope will hold water, the ground contour of the surroundings should be fully considered before the position for the dam is decided upon. An area on which small depressions of suitable lateral decline converge should be chosen. By this means an adequately extensive water-shed may be provided and ample catchment insured. When the plane of a slope is of even grade the excavation may be made in a convenient position, then a few small open drains or plough furrows running diagonally across the slope to the dam will carry in the water.

When the site has been fixed upon, the building of the dam should be commenced by removing the whole of the surface soil from the dam area, including the portion forming the base of the embankment. This soil, being friable and consequently unsuitable for use in constructing the base of the embankment particularly, may be utilized in filling up minor depressions in the orchard surface to bring it to a more even

grade where necessary. Then the whole of the exposed surface of the sub-soil should be ploughed and the portion from the excavation scooped up into position to form the embankment. The objective in ploughing the portion supporting the embankment is to create a rough surface and thus subsequently form, at this point, a combination of the retentive soil particles which prevents seepage from the dam.

The chief factors to be taken into account when calculating the width of the base of the embankment at the sub-soil level are the nature of the clay to be used in the construction of the bank, the extent of the surface area of the water to be stored, and the depth at its maximum level. When these matters have received consideration, and an estimate has been made of the volume of water, care should be taken that the embankment be of ample proportions to contain it, thus obviating possible necessary reinforcement later.

The clay in many instances loses its cohesiveness through the action of the air while the water is at the lower levels, and if the embankment be too steep the earth is washed in by the rippling of the surface water caused by the wind when the higher levels are reached. To guard against this contingency and maintain the maximum holding capacity of the dam, the inside batter of the embankment should be at an angle of about 45 degrees. This detail in construction should always be considered, but more particularly when the surface area of the water is to be extensive, and the situation of the dam is exposed to prevailing winds.

The one-horse scoop, with a capacity capable of shifting about $\frac{1}{3}$ cubic yard of earth, is employed to transfer the clay from the excavation to the embankment after each successive ploughing of the bottom until the desired depth is reached. The number of these scoops used in making a dam varies according to the size of same and the time limit allowed for its completion, but generally from three to six are employed. The one-horse scoop, being made of light material, easily drawn, and on account of the freedom with which it may be manipulated, is now almost exclusively employed for this work in preference to the larger two-horse scoop.

Plate 172 illustrates a section of a dam, with the water at its maximum level, and shows the formation of the embankment with the 2-inch outlet pipe in position. This pipe should be placed as shown, before the building of the embankment is commenced. The intake end of the pipe in the dam should be fitted with an L piece or the end of the pipe may be bent upwards as shown, to prevent the admission of silt, the aperture being covered with galvanized wire netting of fine mesh to exclude *débris*. Should it be desired to irrigate portions of land on either side, at a higher level than the outlet pipe, but below the level of the water in the dam, this may be accomplished by attaching a hose to the pipe and conducting the water to the situation where needed. The water from catchments of this kind, however, is almost invariably used for irrigating the land below the level of the outlet pipe.

It will be seen that the constructing of a dam on a slope is a rather simple proposition, and it will also be observed that in this case the water is both accumulated and distributed by gravitation. But difficulty is often experienced in inaugurating a scheme for the irrigation of an orchard occupying the summit of a ridge or rise when the area of the elevated portion is not sufficiently extensive to afford adequate catchment. To meet this emergency and provide sufficient water with

which to irrigate the elevated part, a reservoir may be constructed in a suitable position on the rise and filled with water pumped from a dam conveniently placed down the slope.

To facilitate the work of excavation a portion of earth to form an inclining bank or ramp about 4 feet wide should be allowed to remain in one corner of the reservoir, and over this the clay is drawn from the excavation on to the embankment. This incline may be used as an ingress and means of egress from the reservoir should subsequent further excavation be necessary. It would also afford, if the embankment were steep, a safe exit for the escape of animals that might fall into the reservoir.

Plate 172A is a drawing showing section of a reservoir, depicting the formation of the embankments, position of the inlet pipe connexion with the dam, outlet pipes and the water at its highest level.

While the excavation is being made and the embankments built up, the horses with the scoops, removing the earth from the bottom after each successive ploughing, pass up the ramp and follow each other around the top of the embankment. The earth is deposited where required, and the continuous tramping, even if the clay be of only average retentiveness, causes it to set firmly so that the banks almost invariably hold the water satisfactorily

The illustrations representing the dam and reservoir, as they appear on the opposite pages, may be considered as one, and regarded as a longitudinal section, showing the engineering principles involved in the establishment of this method of irrigation. As the water accumulates in the

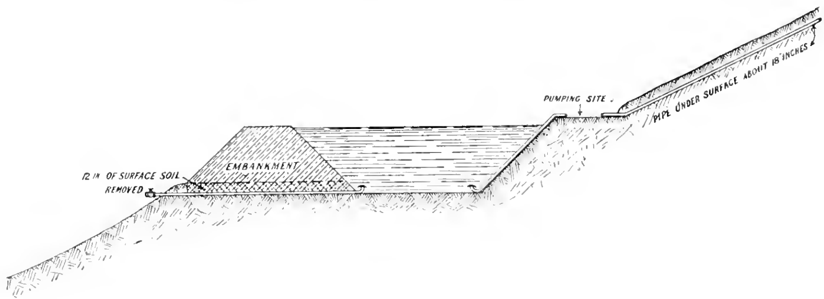


Plate 172.—Section of dam showing embankment and portion of outlet pipe, &c.

dam during early winter it is pumped through the 2-inch connecting pipe into the reservoir and stored there until the following summer. When the reservoir has been filled and pumping ceases, the dam with provision made for the overflow is allowed during late winter to accumulate water to its regulated holding capacity. The pumping site should be near the dam as shown in the illustration, and when in an exposed position, a windmill may be employed to operate an ordinary suction pump. If the pumping site be sheltered, however, an oil engine with centrifugal pump of sufficient power to lift the water to the desired level will give more satisfactory results.

In commencing to irrigate from the reservoir the land between the level of the stand and horizontal pipes should be watered first from the former and then the land below it from the latter. The land above the level of the horizontal discharge might be watered by a hose attached to this pipe, but experience would eventually prove the stand-pipe

method to be the more economical. These pipes should be placed in position prior to commencing the building of the embankment.

The water may be drawn from the dam or reservoir by the siphon principle, but in general practice the pipe method of delivery may be regarded as the more satisfactory.

A light iron plate placed in the position shown in the illustration receives from the inlet pipe connexion the water from the dam and this saves the face of the embankment and prevents its washing in.

Methods of Applying Water at the Different Degrees of Surface Decline suitable to the Different Classes of Soil.

Great diversity of physical construction as well as surface decline characterizes the soils of our hilly and rolling lands suitable for dam and reservoir schemes. The soils in these districts range from the stiff retentive order overlying yellow impervious clays to those of the friable loam and loose sandy class with porous sub-soils. Loose soils are more

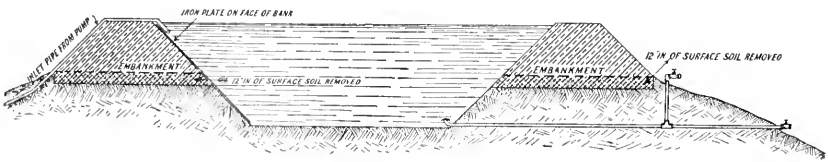


Plate 172a.—Section of reservoir showing formation of embankments, position of inlet pipe connexion with the dam, outlet pipes, &c.

easily wetted than compact ones, and care should be taken, when treating either class, that the water be systematically applied, in order that all the good results which accrue from scientific irrigation may be attained.

The drawings in Plate 173, like the others used to illustrate these articles, are original, and they show in longitudinal and cross-sections the methods by which the water may be distributed under the different soil conditions. The furrow method of watering is employed and the long sections represent the furrows in the direction of their length, and running with the slope which is at an angle of 20 degrees from the horizontal. Fig. 1 represents soil suitable for irrigation, friable, yet sufficiently impervious to enable it to carry the water from the delivery pipe along the full length of the furrow in which it may be controlled by means of checks until distributed as required. The arrows from the vertical indicate the downward percolation of the water, and the uppermost row of arrow-heads denotes the line of demarcation between the surface and sub-soils. The lower row of arrow-heads indicates that the water, having percolated through the sub-soil, has reached the stratum below. In this the five arrows running parallel to the surface line depict the free water draining away. Fig. 2, being a cross-section of Fig. 1, further illustrates that, when the soil is of a character highly amenable to irrigation, the water, as the arrows denote, percolates gradually outward and downward from the furrow by almost semi-circular radiant movement In treating a loose surface with porous sub-soil, however, the furrow is unable to carry the water the necessary distance away from the delivery pipe, because the descent of the water is much more rapid, and gives a considerably less lateral spread.

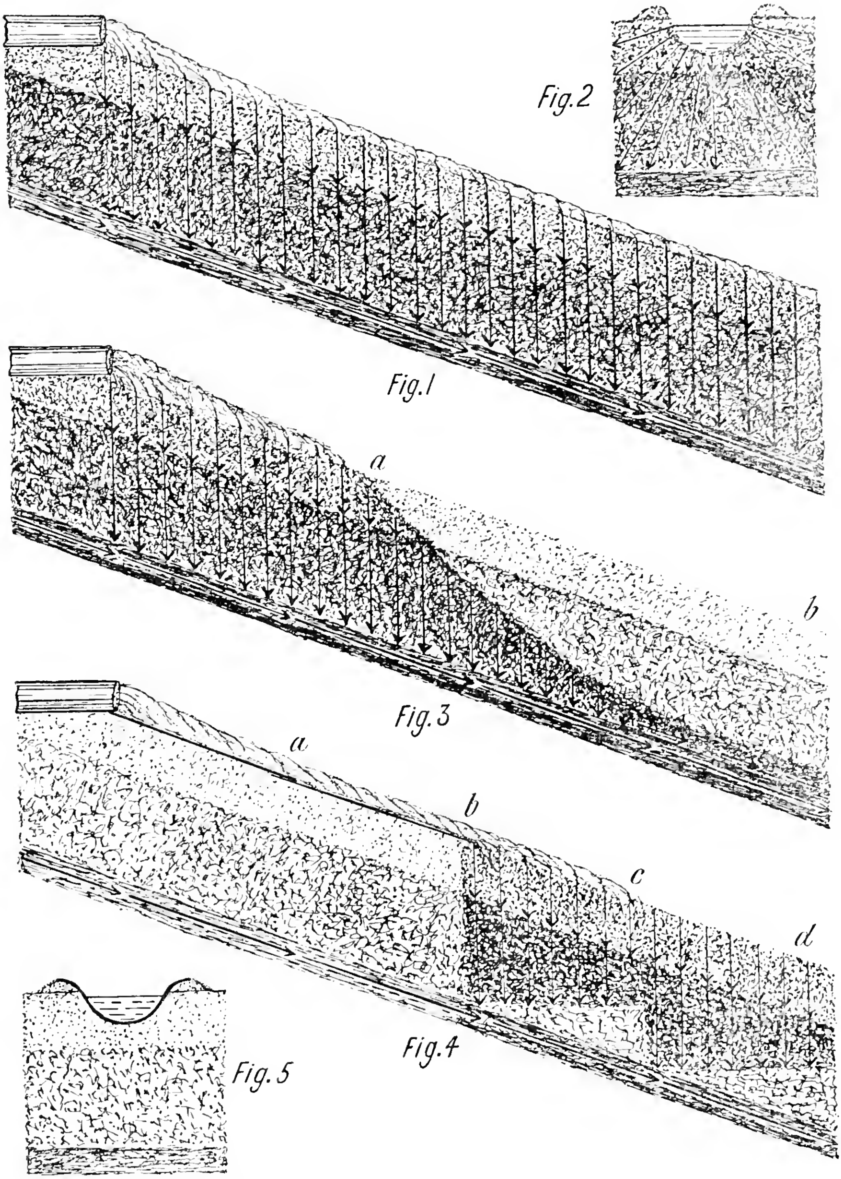


Plate 173.—Methods of irrigating the different classes of soil.

These loose soils, no matter in what part of the State they occur, are almost invariably unfavorable for apple culture, but, if fairly rich in plant food, they may, according to their physical construction and local situation, be utilized for the production of citrus fruits, peaches, pears, passion fruit and berries. Oranges, lemons, and peaches thrive well under irrigation on the sandy rises at Mooroopna, Cobram, and other parts of the north. Pears may, with careful management, be profitably cultivated on the sandy loams of Burwood, Brighton, and Cheltenham; while the red, loose soils of South Gippsland, Wandin, &c., are suitable for the cultivation of cherries, passion fruit and berries.

These open soils respond freely to scientific irrigation. When they are being irrigated, the water, as it escapes from the delivery pipe, instead of being carried the full length of the furrow as illustrated in Fig. 1, disappears a short distance from the pipe as shown in Fig. 3 (*a*). The length of the stream is regulated according to the looseness of the soil. The water descends as shown by the arrows and drains away. leaving the portion of land between (*a*) and (*b*) unwatered.

In order to overcome these difficulties and insure equitable and economic distribution, the method of applying the water shown in Fig. 4 may be practised. In this case the furrow is lined with strips of old canvas or other suitable material, over which the water flows freely to the point where it is required for distribution. One strip lines the furrow between the delivery pipe and (*a*), and overlaps by a few inches the strip to (*b*), and two strips are similarly placed between (*b*) and (*d*). When the water reaches the point (*c*) the lining between it and (*d*) is removed, and the soil is watered as indicated by the arrows passing through the heavily shaded portion of earth. The part between (*b*) and (*c*) is next treated, and so on till the watering of the whole section is completed. The terraced formation described by the two horizontal rows of arrow-heads running from the stratum to the left denotes the portion of soil affected when the water is scientifically applied, but further penetration takes place later. It is not suggested that the watering in every instance can be accomplished with such unerring precision as the illustration would seem to indicate, but, as the supply of water is usually limited, this should, nevertheless, be the operator's objective. Fig. 5 is a cross-section of Fig. 4, showing the canvas lining containing the water in the furrow.

The better, although a more expensive mode of watering raspberries, loganberries, gooseberries, and other shallow-rooting plants when cultivated on loose soil, is by the employment of a system of overhead sprinklers connected by 1-inch iron piping with the outlet supply pipe. Not alone is an even, economical and more natural distribution of the water afforded by this means, but the sprinkling banishes thrip, which badly infests the flowers of these plants during the early part, particularly, of dry, warm seasons.

It has already been stated that the roots are most active when there is just the proper amount of moisture present in the soil. The proper amount may be defined as the quantity of water necessary to moisten all the soil particles, but not enough to cause saturation by excluding the air from the soil's interspaces. This essentially healthy environment is set up when all the free water has been carried away; good drainage hastens its creation and maintains this condition. The trees draw their supply

from the residual portion known as the capillary moisture which contains the elements of plant food. By its capillary ascent or inclining upward movement, this solution is made available to the feeding roots as illustrated in Plate 171, Fig. 2 (*a*). A scientific irrigationist, knowing the effect of a check on his trees, would not permit the capillary

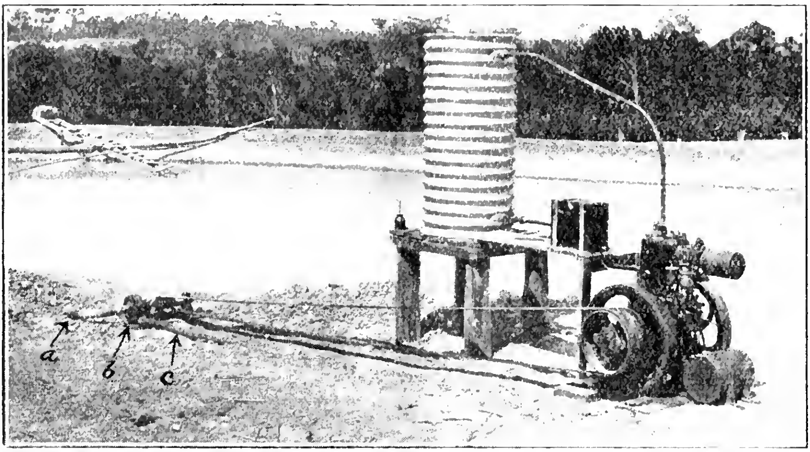


Plate 174.—Engine and pump used by Mr. J. Stephens at his orchard, East Burwood.

Plate 175.—Mr. J. Stephens' reservoir.

moisture in the soil to become exhausted and not replenish the supply. Now it will be understood that regular and systematic waterings during the growing periods are desirable.

Although irrigation is essential in the warmer parts of the State, the apple being of naturally thrifty habit, is capable of adapting itself to comparatively dry soil conditions, provided the district in which it is

grown be cool and that the land be kept cultivated. When irrigation has been introduced into such an orchard, however, the trees use up considerable quantities of water. Then the waterings should be regularly and systematically applied, because, when they have become accustomed to a regular supply, its irregular application or discontinuance during the period of vegetation would have an evil effect on the trees. It may be easily understood that the changed and inimical root environments set up by the exhaustion of a customary supply of capillary moisture would cause a check in the growth of the trees and otherwise injuriously affect them.

In connexion with the distribution of water on a partly impervious surface, it should, perhaps, be further explained that, especially if the fall be more abrupt than that illustrated in Plate 173, the furrows may be made to run at such an angle, or by such deviations across the plane of the area under treatment as will insure a gentle flow of the water and thus afford sufficient time for downward penetration. A further study

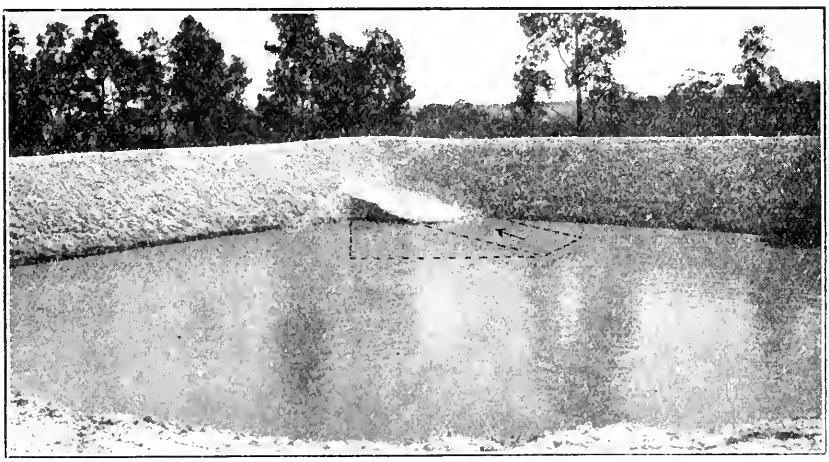


Plate 176.—View of the ramp in the reservoir.

of what has been previously written concerning the advantage of diagonal planting in relation to irrigation as well as the illustration in Plate 14, will enable the reader to better understand how water may be controlled and distributed on abrupt slopes.

Plate 174 shows the pumping plant employed by Mr. J. Stephens, of East Burwood, to transfer the water from his dam to the reservoir. The engine is of three-horse-power, but is capable of developing up to five-horse-power. The water is drawn from the dam through the 2-inch suction pipe (*a*), by the centrifugal pump (*b*), operated by means of a belt from the driving wheel, and forced up through the pipe (*c*) to the reservoir. Since its erection this plant has given entire satisfaction, and the cost of working it has been very moderate.

Plate 175 is a photographic illustration of Mr. Stephens' reservoir, taken soon after its construction and before it was filled with water.

Plate 176 gives a view of the ramp, denoted by the arrow, in the reservoir which contains water to about one-third of its holding capacity.

Plate 177 illustrates what has been previously stated concerning the rippling water washing in the embankments, and shows the necessity for banks with suitable batter and of solid construction.

The writer has no hesitation in stating that there is no class of persons engaged in rural occupations, where maximum production with minimum expenditure should be the objective, requiring more knowledge

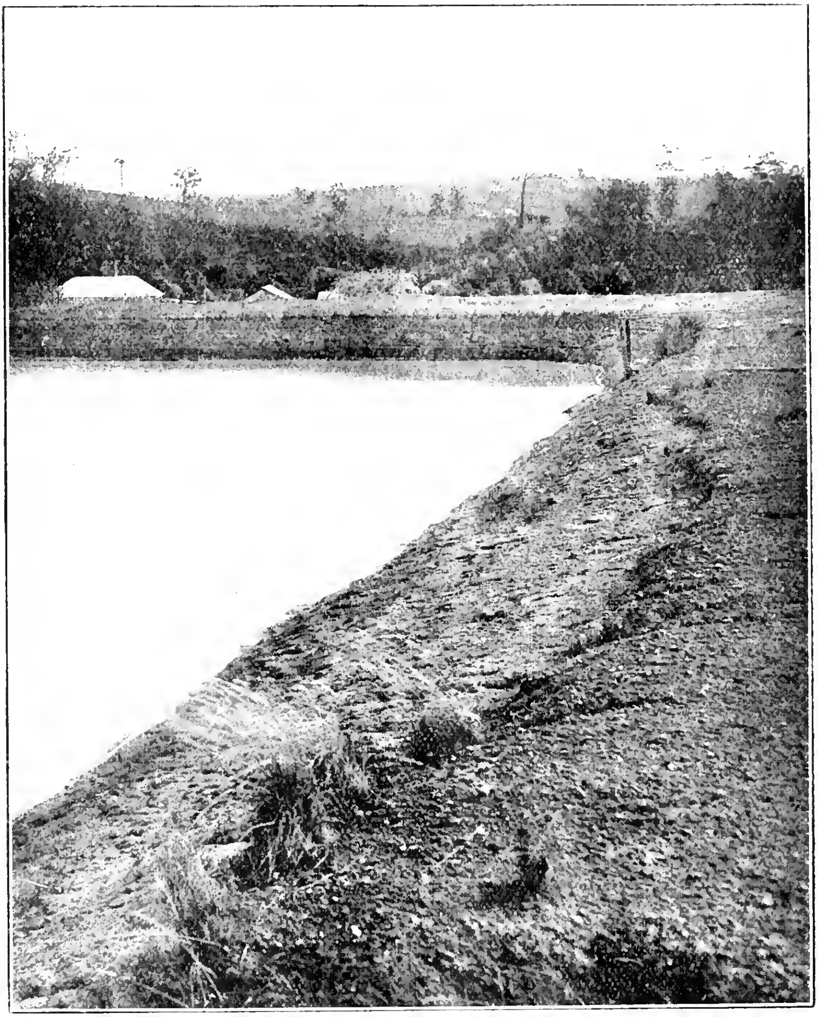


Plate 177.—Shows the inside batter of a dam.

concerning a particular industry and its general details, than orchardists. Even from what has already been written, it is plain that Nature study is largely involved, and that the subject of fruit-growing literally teems with scientific, engineering and mechanical problems.

(*To be continued.*)

AGRICULTURE IN AMERICA.

Letter from Mr. A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent to the Director of Agriculture.

[Like the letter published in the *Journal of Agriculture* for July, this one, too, is unofficial, but as its contents will be interesting to readers, I am taking the liberty of publishing it.—S.S.C.]

Since I last wrote you I have visited the University of Illinois and the Agricultural Experiment Station, Urbana, Ill.; the State Department of Agriculture, Columbus, Ohio; the State University, Ohio; the Carnegie Foundations at Pittsburgh, and the Department of Agriculture at Washington. Five whole days were spent in travelling.

The University of Illinois and the State University of Ohio have associated with them two of the leading Colleges of Agriculture in America. Indeed, with the possible exception of Cornell University, they are probably the best Agricultural Colleges in North America.

Each of them has a remarkably strong agricultural faculty, and a body of over 1,000 students, taking a four-year course for the degree of agricultural science. Both of these institutions enjoy a remarkable degree of confidence, and the short courses held in winter time for farmers are crowded with students. Last year at Ohio over 4,000 farmers attended the college during the "round up," *i.e.*, a school of one week's duration, held in February.

Curiously enough, at Ohio, the Federal Experiment Station is separated from the State University. It is located at Wooster, several hundred miles away. Only one other college (New York State) has the experiment station separated from the college.

Both these colleges are in the rich corn belt, where the average holding is from 150 to 160 acres. Twenty years ago there were seventeen students in the whole of the agricultural courses at Illinois. Last year there were 1,230 undergraduate students, and 75 graduate students in residence. Similar growth has been observed at Ohio.

Whilst at Ohio I investigated the working of a typical State Department of Agriculture of the United States. The work is entirely inspectional and regulatory. The educational and investigational work are carried on by the College and Experiment Station. The Department manages the State Fair at Columbus, and maintains six administrative and regulatory bureaux—

1. *Live Stock Inspection.*—Control of animal diseases, distribution of serum, and veterinary inspection of stallions.
2. *Horticultural Bureau.*—For control of disease in nurseries, orchards and apiaries.
3. *Bureau of Feeds and Fertilizers.*—Control of Artificial Fertilizer Act, stock foods, and Fungicides Act.
4. *Bureau of Markets.*—Which promotes the establishment of co-operative societies within the State.
5. *Dairy Bureau.*—The control and inspection of creameries and cheese factories. Most of the milk inspection work is carried out by city ordinances.
6. *Fish and Game Bureau.*—An important bureau, because Ohio borders on the Great Lakes, and has a good river system.

The Department is under the control of a Secretary for Agriculture—a professional man—and a Board of seven, appointed by the Governor. Government by Boards appears to be the usual method of control of Departments in America. These Boards are necessary, because there are no Cabinet Ministers in the States. The Governor is the controlling power, and in most States a large number of the higher administrative officials, and many of the Boards of Control, change with each change of Governor. It is rather interesting to note that in Ohio an Advisory Board of three has been appointed to prevent overlapping in the agricultural work of the State. A law was passed appointing the Secretary of Agriculture, the Dean of the College of Agriculture at the State University, and the Director of the Agricultural Experiment Station as a Board to control all agricultural developments which affected more than one of these three interests.

At the State Fair I saw a building which would interest you. It was a huge Coliseum—a building erected primarily for the judging of stock at the State Fair. Americans lay much stress on stock judging, and at most fairs there is some building set apart where spectators may witness the judging of cattle and horses. This Coliseum is 325 feet long and 225 feet wide, with a single cantilever roof, tied underneath by steel girders. The arena is 190 feet long and 110 feet wide, and is magnificently lighted. The cost was 200,000 dollars (£41,600). It will seat 12,000 people, and has proved to be a great educational factor in the State Fair.

The Department of Agriculture at Washington is a colossal institution—colossal in organization, scope of its work, and in results it is achieving in war work. It must be giving the nation good dividends, because Congress is appropriating almost incredible sums for its activities, and frequently appropriates millions of dollars more than the Estimates provide for.

I had planned to spend three weeks at Washington, and thought I could acquire a very thorough knowledge of its work. There are no less than sixteen huge bureaux—animal industry, plant industry, forest service, chemistry, soils, entomology, biological survey, crop estimates, States Relation Service (extension work), rural engineering, markets, rural organization, farm management, weather service, publications.

The Secretary for Agriculture (Mr. Houston), who is a member of President Wilson's Cabinet, spent a whole morning in giving me the history of the development of the Department, its main lines of work, and the chief regulatory, investigational, and extension activities of the Department. He then arranged with the chiefs of each bureau to give me a bird's eye view of the work each bureau is doing.

I found that it took at least a morning for each head of the bureau to sketch the main lines of work of their Departments, and I shall have to content myself with these general views, supplemented with some details in the plant industry, soils, farm management, animal industry, markets, rural organization bureaux, and the States Relation Service. The Department has over 18,000 employees, and is housed in 40 separate buildings in various parts of the city of Washington. Some of the buildings are immense structures, and exceed in size the whole group of buildings in the Treasury Gardens, Melbourne.

The ordinary expenditure of the Department for salaries and expenses is 26,000,000 dollars (£5,416,700). In addition, there are permanent annual appropriations amounting to 17,500,000 dollars (£3,645,800), making a total ordinary expenditure of 43,500,000 dollars (£9,062,500). Then the emergency appropriation for war work brings the expenditure over 60,000,000 dollars (£12,500,000). Some idea of the investigational work of the Department may be gained from the fact that the outline of projects under investigation covers 502 pages of closely-printed matter.

I have obtained details of every item of expenditure submitted to Congress, the report of the Committee of Congress on the appropriations, and a list of every project in every Department, together with the plan of attack, and the results so far secured.

During the course of a week a collection of flax seeds, hemp, cotton, corn, tobacco, wheat, oats, barley, and dry land sorghums will probably be despatched by the Office of Plant Introduction. I selected a number of seeds of varieties which do well in the various climatic regions of the United States, and have asked the Office of Plant Introduction to fumigate them, to remove all possibility of introducing any fungoid disease. These seeds will probably reach you in time for planting the wheat, barley, oat, and flax varieties at Werribee.

The principal items of expenditure for the Department of Agriculture are as follow (for year ending 30th June, 1917):—

Office of Secretary	$717,820	(£14,945)
Bureau of Plant Industry ..	$3,143,630	(£654,922)
Bureau of Animal Industry ..	$3,810,000	(£793,750)
Forest Service	$5,712,275	(£1,190,057)
States Relation Service	$3,107,660	(£647,429)
Weather Bureau	$1,783,140	(£371,487)
Bureau of Chemistry	$1,200,591	(£250,123)
Bureau of Entomology	$931,480	(£194,058)
Bureau of Biological Survey ..	$592,010	(£123,335)
Bureau of Crop Estimates ..	$323,452	(£67,385)
Bureau of Soils	$363,735	(£75,778)
Bureau of Markets	$1,718,575	(£358,036)
Miscellaneous Services	$2,514,745	(£523,905)
Total for salaries and expenses..	$25,919,113	(£5,399,810)
Permanent annual appropriations	$17,235,000	(£3,590,621)
	$43,154,113	or £9,000,000*

(*Approximately.)

In addition to these annual commitments, there are the emergency appropriations to cover the period of the war, and, with these, the expenditure for 1918 will amount to over 60,000,000 dollars (£12,500,000).

The sixty-fourth Congress (1917) passed an Act called the Smith Hughes Act, which provides for co-operation between the Federal

Government and the States for the promotion of vocational education in the fields of agriculture, home economics, and industry. It insures an annual appropriation for the stimulation of this work, and creates machinery for expending the money in accordance with the law.

The money granted in 1917-18 by the Federal Government amounts to $1,860,000 (£387,500). The amount increases annually for ten years, when the appropriation will be $7,367,000 (£1,535,000). This is an interesting example of the principle of Federal aid to education.

The Federal Government proposes to grant this money to the States on a population basis on the following conditions:—

(1) All schools receiving Federal aid must be under public supervision.

(2) The purpose of the education is to fit the individual for useful employment.

(3) The instruction must be less than *academic grade,* and designed to meet the needs of pupils over fourteen years who are preparing to enter upon farm work.

(4) *Every* dollar of Federal funds must be matched by a dollar of State funds, or local funds, or both.

As the States must contribute dollar for dollar, the ultimate annual expenditure will be over 14,500,000 dollars (£3,021,000) for vocational training. Six and a quarter million dollars are to be expended on agriculture, a similar amount on trade and home economics, and 10,000,000 dollars (£2,084,000) on the training of teachers.

The Board appointed by the Federal Government to control the vocational educational work is located at Washington. I met the Director of the Board and the Head of the Agricultural Division, and secured valuable informaton on the work of the Board. The principle underlying this new method of teaching agriculture is to concentrate all the educational work of the school around a "project," *e.g.,* the raising of some specified crop, such as corn, wheat, potatoes, on the home farm or some neighbouring farm.

The boy from fourteen to eighteen, who does not intend to go to the Agricultural College, but who wishes to take a course in agriculture, will carry on some project (raising crops or caring for animals, *e.g.,* production of baby beef, raising of calves, poultry, or pigs), and spend half his time on the project. In the school he receives instruction in agricultural science, English, and civics. Practically the whole of the instruction is to be linked up and correlated with the particular project in hand. I understand that this system of training has produced remarkably good results in Massachusetts, in which State there are a number of agricultural schools (high schools) which have had great success in training boys in this manner. Inasmuch as the Federal Government, with the unanimous consent of the States, has decided to support this type of instruction with Federal money, it would seem that the system must have some merit. I propose to inspect one or two of these typical Agricultural High Schools in Massachusetts, to judge for myself the results of this system of vocational training.

I have not attempted to give details of the work at Illinois and the Ohio Colleges of Agriculture, nor of the many-sided activities of the

Department of Agriculture. I have, however, detailed notes of every interview, and all that I have seen, and these notes can be better presented when time and contemplation place them in their proper perspective.

The information so far gained has been up to expectation, and I feel that I will be able to turn much of what I have gained to immediate practical use on my return. The time is flying fast, and much remains to be done, but I hope to be able to complete what I mapped out within my specified time. From Washington I go to New York State, and visit the famous Cornell University—which has the largest and most successful Agricultural College in America—and the Geneva Agricultural Experiment Station; then Massachusetts, to see the Agricultural High Schools and the way in which vocational agriculture is taught. From Massachusetts I shall proceed to Canada to examine the work of the Canadian Department of Agriculture, the Ontario Agricultural College, and the Macdonald Institute. From Guelph I intend going to Chicago—the University of Wisconsin and the Minnesota Agricultural College—the centres of wheat and barley breeding in the States. Thence to the Winnipeg Agricultural College and the Canadian prairies and Vancouver.

The American people are facing war problems with great spirit and quiet courage. Secretary Baker officially announced that there were over half-a-million men in France; but it is generally believed that the number there now is not far from a million. President Wilson, at the Metropolitan Theatre, in New York, last night, said that they would not limit the army to 5,000,000 men, but would send as many men as were wanted to achieve victory, and win the war "worthily." The shipyards are turning out ships with extraordinary speed, and you read of fresh launchings almost every day. Concrete ships, steel ships, and wooden ships are being turned out at Portland, Seattle, San Francisco, Philadelphia, and a dozen other places. It was stated that one shipyard alone will this year turn out as much shipping as was built in one year by Great Britain before the war. At every college I have seen thousands of men (mostly college graduates) training for officers. In Washington there are temporary structures, housing several thousands, being built all over the open spaces of the district of Columbia. In the West I saw but few soldiers in the streets and cafés, but in the East they are to be seen everywhere. The Secret Service is doing good service. One does not read of their activities in the press, but they have had a difficult task in putting an end to pernicious propaganda and by ferreting out nests of pro-Germanism. The Food Conservation Administration has done fine work, and the co-operation of the people and the press has been remarkable. The only disturbing feature has been the delay in aeroplane construction; ugly rumours of graft have been heard, and President Wilson has ordered a complete investigation to be made by a Supreme Court Judge.

Very little news is reported from Australia. The only two items recorded recently, other than an occasional reference to the Anzacs on the Amiens line, were the change of Government in Victoria, and the arrival of Mr. Hughes, after an exciting adventure near Australia.

I have found that the people here know very little about our Commonwealth. They regard it as a land of drought, and appear to think that droughts are the rule rather than the exception. They seem astonished when they hear the plain truth about Australia. Ours, however, is not the only country that suffers from dry seasons. California has just had the worst drought since 1849, and in Texas and South-Western United States there has been a two-year drought, and fodder is being brought from all the other parts of the continent.

The cost of living is extraordinarily high in America. The meal you would get in Melbourne for 1s. 6d. costs, at least, 1½ dollars in the United States. In fact, a shilling and a dollar seem about the same value in the two countries, so far as food is concerned. The United States had a record crop of potatoes last year. All the same, you have to pay 20 to 30 cents (10d. to 1s. 3d.) for potatoes in most restaurants. Prices of other commodities are in similar proportion.

I hope the season opens favorably in Australia, and that we shall be favoured with another good year. The general view here is that Europe is almost cleaned out of grain, and that the belligerents have made serious encroachments on their live stock reserves, and that all surplus food—animal or cereal—will be wanted during the next few years. At last the problem of checking the submarines seems in sight of solution, and with the enormous tonnages now being turned out at the shipyards the time is rapidly approaching when the freight situation will be easier. Production is not materially increasing in the States, despite all encouragement and exhortation. With further depletion of man power to fill the new armies, the position must grow worse.

Correction.

In Mr. Richardson's letter published in last month's *Journal of Agriculture*, it was stated in the remarks on Colorado (page 387), that "beef is worth $16 a ton at present." The sentence, of course, should have read "beef is worth $16 *a cental* at present."

A CONTRIBUTION TO THE STUDY OF HEREDITARY UNSOUNDNESS IN HORSES.

By W. A. N. Robertson, B.V.Sc., Chief Veterinary Officer.

(Continued from page 433.)

Family 3.

This is undoubtedly an unsound family; out of 326 horses examined, 109, or 33.4 per cent., were affected with sidebone or ringbone. The founder of the line was not examined, neither were any of his sons; but

of 21 of his grandsons, 33 per cent. were declared unsound. The following table shows the unsoundness in each generation :—

TABLE SHOWING UNSOUNDNESS IN FAMILY 3.

Sires.	Sons.			G Sons.			GG Sons.			GGG Sons.			GGGG Sons.		Total.		
	Examined.	Unsound.	Percentage.	Examined.	Unsound.	Percentage.	Examined.	Unsound.	Percentage.	Examined.	Unsound.	Percentage.	Examined.	Unsound.	Examined.	Unsound.	Percentage.
3·1 ..	4	3	75·0	113	46	40·8	112	35	31·2	14	7	50·0	1	..	244	91	37·2
3·2 ..	2	..	..	9	1	11·1	16	6	37·5	3	..	..	..	..	30	7	23·3
3·3 ..	9	3	33·3	14	5	35·7	7	1	14·3	..	..	..	..	..	30	9	30·0
3·4 ..	3	..	..	13	..	..	1	..	..	..	..	..	..	..	17	..	..
3·5 ..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..
3·6 ..	2	1	50·0	..	..	..	..	..	..	..	..	..	..	..	2	1	50·0
3·7 ..	..	..	..	..	..	..	2	1	50·0	..	..	..	..	..	2	1	50·0
Total	21	7	33	149	52	34·9	138	43	31·2	17	7	41·0	1	..	326	109	33·4

It will be noticed that, of the stallions examined, 244 were descendants of 3.1, 37.2 per cent. were unsound, representing 75 per cent. unsound sons, 40 per cent. unsound grandsons, 31 per cent. unsound great-grandsons, and 50 per cent. unsound great-great-grandsons.

Unsoundness is such a prominent feature in the progeny of Family 3 that it may be considered as the dominant factor, and an explanation must be looked for when soundness appears dominant in any branch. It would have been particularly interesting to have had examinations of all the members of this family as aged horses, for among the 153 sound descendants of 3.1, we find 4 were two years, 60 were three years, 29 were four years, 43 were five years, and 16 were six years old or over at the time of examination. As mature horses, there would unquestionably have been many more unsound members in the family than the total now recorded.

3.1, and many descendants of his not recorded in these tables, are found very frequently on the dams' side of unsound horses which are descendants of stallions known to be sound.

The first sound line in this family is noted in 3.141 and his descendants. He was sound when aged, and his six sons examined were also sound—five of them being five years or over at examination. Three grandsons were sound, and two unsound. Evidently, therefore, unsoundness is not so strongly developed in this line. Can we ascertain why?

The dam of 3.141 was by 6A.11. Nine descendants of this horse were examined as mature horses, and only one was unsound. Unfortunately, the full pedigree of this unsound horse has not been obtained. We may assume 6A.11 was sound, and his influence is seen through 3.141.

The breeding of 3.15 on the dam's side cannot be traced, but he also probably introduced soundness, for of his unsound descendants—

3.156 was from a mare by 3, the founder of this family.
3.1541 was from a mare by 3.100014, an unsound horse.
3.1514 was from a mare by 1.11, a very unsound sire.
The remaining four cannot be traced.

As there are a number of four and five year old horses in this branch sound, it may be assumed that the tendency to unsoundness is at any rate diminishing.

The stallion 3.102 was not examined, but he left 42 per cent. of unsound descendants, and of the sound ones, 24 were three years of age or under at time of examination. This horse appears very frequently as the sire of dams in unsound pedigrees.

The balance of the members of this sub-family show so much unsoundness that one is forced to the conclusion that the defects are present in the stallions themselves, and could not be carried entirely by the dams.

The line with 3.4 at its head is apparently sound, for, in the seventeen descendants examined, no trace of sidebone was found. 3.41 was from a mare by 6.1, a horse which, from the records, appears to be sound.

The complete tables for this family are as follows:—

FAMILY 3.

- 3
  - 3·1, not examined
    - 3·11, not examined
      - 3·111, **ringbone**, 5
    - 3·12, not examined
      - 3·121, sound, 6
        - 3·1211, sound, 4
        - 3·1212, sound, 2
      - 3·122, not examined
        - 3·1221, sound, 5
        - 3·1222, sound D.A.P., 5
      - 3·123, sound, 4
      - 3·124, **sidebone**, 4
      - 3·125, not examined
        - 3·1251, sound, 3
    - 3·13, not examined
      - 3·132, sound, 4
      - 3·134, not examined
        - 3·1341, Nervy, 5
      - 3·131, **sidebone**, a
      - 3·133, **sidebone**, a
      - 3·135, **sidebone**, 3
    - 3·14, not examined
      - 3·141, sound, a
        - 3·1411, sound, 5
        - 3·1412, sound, 6
          - 3·14121, sound, 5
          - 3·14122, sound, 5
          - 3·14123, **sidebone**, 5
          - 3·14124, **sidebone**, 4
        - 3·1415, sound, 6
        - 3·1416, sound, 6
          - 3·14161, sound, 4
        - 3·1413, sound D.A.P., 5
        - 3·1414, sound D.A.P., 3
      - 3·143, not examined
        - 3·1431, **sidebone**, 5
        - 3·1432, **sidebone**, 3
      - 3·142, **sidebone**, 4
      - 3·144, **sidebone**, 4
    - 3·15, not examined
      - 3·151, sound, 5
        - 3·1511, sound, 5
        - 3·1513, sound, 2
        - 3·1515, sound, 3
        - 3·1516, sound, 3
        - 3·1517, sound, 3
        - 3·1512, sound D.A.P., 3
        - 3·1514, **sidebone**, 3
      - 3·152, sound, 3
      - 3·1501, sound, 4
      - 3·153, sound, 3
        - 3·1531, **sidebone, ringbone**, 3
      - 3·154, not examined
        - 3·1541, **sidebone**, 3
      - 3·155, sound, 4
        - 3·1551, sound, 5
        - 3·1552, sound, 3
      - 3·157, not examined
        - 3·1571, sound, 5
        - 3·1572, sound, 5
        - 3·1573, sound, 4
      - 3·158, not examined
        - 3·1581, **sidebone, ringbone**, 7
      - 3·159, not examined
        - 3·1591, sound, 3
      - 3·1502, sound, 5
        - 3·15021, **sidebone**, 3
      - 3·1503, not examined
        - 3·15031, sound, 4
      - 3·1504, sound, 4
        - 3·15041, sound D.A.P., 4
        - 3·15042, sound D.A.P.
        - 3·15043, sound D.A.P., 3
      - 3·1505, not examined
        - 3·15051, **sidebone**, 5
      - 3·1506, not examined
        - 3·15061, sound D.A.P., 4
      - 3·1507, sound, 7
        - 3·15071, sound, 4
      - 3·156, **sidebone**, a
        - 3·1561, sound, 6
    - 3·16, not examined
      - 3·161, sound, 5

Family 3—*continued.*

3	3·1, not exam'd. —*contd.*	3·17, not examined	3·171, **sidebone,** 6	3·1711, **sidebone,** 4		
		3·18, not examined	3·181, not examined	3·1811, **sidebone,** 6		
			3·182, **sidebone,** 5			
		3·19, not examined	3·191, sound, 3			
			3·192, sound, 5			
			3·193, sound, 3			
			3·194, sound, 5			
			3·195, sound, 3			
		3,101, not examined	3·1011, **sidebone**			
		3·102, not examined	3·1021, **sidebone,** a	3·10211, **sidebone,** 5	3·102111, sound [D.A.P., 3	
			3·1022, not examined	3·10221, sound, 2		
				3·10223, sound, 3		
				3·10224, sound, 5		
				3·10225, sound, 4		
				3·10226, sound, 6		
				3·10227, sound, 3		
				3·10228, sound, 5		
				3·102203, sound, 4		
				3·10222, **sidebone, ringbone,** 5		
				3·10229, **sidebone,** 4		
				3·102201, **ringbone,** 4		
				3·102202, **sidebone,** 5		
			3·1023, not examined	3·10231, sound, 4		
				3·10233, sound, 3		
				3·10234, sound, 5		
				3·10232, **sidebone,** 3		
			3·1024, sound, 3			
			3·1025, **sidebone,** 8	3·10251, sound, 3		
				3·10252, sound, 3		
				3·10253, **sidebone,** 3		
			3·1026, **sidebone, ringbone,** 9			
			3·1027, **sidebone,** a	3·10271, **sidebone,** 3		
				3·10272, **sidebone,** a		
			3·1028, sound, 4			
			3·1029, sound, 4			
			3·10201, sound, 5			
			3·10202, sound, 5	3·102021, **sidebone,** 3		
			3·10203, sound, 3			
			3·10204, sound, 11			
			3·10205, sound, 6			
			3·10207, sound, 6	3·102071, sound, 4		
				3·102072, sound, 3		
			3·10208, not examined	3·102081, sound 3		
			3·10209, sound, 5	3·102091, sound, 3		
			3·102001, sound, 5			
			3·102002, sound, 5			
			3·102003, sound, 4			
			3·102004, **sidebone,** 5	3·1020041, sound, 5		
			3·102005 **sidebone,** 4			
			3·102006, **sidebone,** a			
			3·102007, **sidebone,** 5			
			3·102008, **ringbone,** 6			
			3·102009, **sidebone,** 4	3·1020091 **sidebone,** 3		
			3·1020001, **sidebone, ringbone,** 7			
			3·1020002, **sidebone,** 4			
			3·1020004, **sidebone,** 5			
			3·1020003, **sidebone,** 12	3·10200031, sound, 7		
				3·10200033, sound, 3		
				3·10200036, sound, 3		
				3·10200039, sound, 3		
				3·102000302, sound, 3		
				3·102000303, sound, 3		
				3·102000304, sound, 4		
				3·102000305, sound, 3		
				3·102000306, sound, 6		
				3·102000307, sound, 3		
				3·1020003001, sound, 3		
				3·1020003003, sound, 5	3·10200030031, **sidebone,** 3	
					3·10200030032, **sidebone,** 4	
				3·1020003006, sound, 3	3·10200030061, sound, 3	3·102000300611, sound, 5
					3·10200030062, **sidebone,** 3	

FAMILY 3—*continued.*

3	3·1, not examined —*contd.*	3·102, not examined — *continued.*	3·1020003, **sidebone**, 12 —*continued.*	3·1020003008, sound, 3	
				3·10200032, sound D.A.P., 3	
				3·1020003007, sound, D.A.P., 5	
				3·1020003009, sound D.A.P., 11	
				3·10200034, **sidebone**, 8	
				3·10200035, **ringbone**, 3	
				3·10200037, **sidebone**, 7	
				3·10200038, **sidebone**, 4	
				3·102000301, **sidebone, ringbone**, 6	
				3·102000308, **sidebone**, 3	
				3·102000309, **sidebone**, 3	
				3·1020003002, **sidebone**, 3	
				3·1020003004, **sidebone**, 3	
				3·1020003005, **sidebone**, 8	
		3·103, not examined	3·1031, sound, 3		
			3·1033, sound, 3		
			3·1032, **sidebone**, 3		
		3·104, not examined	3·1041, sound, 5		
			3·1042, **sidebone**, 5		
		3·105, not examined	3·1051, sound, 5		
			3·1052, sound, 5		
		3·106, not examined	3·1061, **sidebone**, 4	3·10611, sound, 3	
		3·107, not examined	3·1071, sound, 3		
			3·1072, sound, 3		
		3·108, not examined	3·1081, not examined	3·10811, not examined	3·108111, sound, 3
					3·108112, **sidebone**, 3
		3·109, **sidebone**, 10			
		3·1001, not examined	3·10012, sound, 3		
			3·10013, sound, 5	3·100131, sound, 4	
				3·100132, sound, 5	
			3,1001, Shiverer, 3		
			3·1001, **sidebone, ringbone**, 5		
		3·1002, not examined	3·10021, sound, 4		
		3·1003, **sidebone**, a	3·10031, sound, 4		
			3·10034, sound, 4		
			3·10037, sound, 5		
			3·10038, sound, 5		
			3,10039, not examined, 4	3·100391, sound, 5	
			3·100301, sound, 4		
			3,100302, sound, 3		
			3·10032, **sidebone**, 2		
			3·10033, **sidebone**, 4		
			3·10035, **sidebone**, 4		
			3·10036, **sidebone**, 3		
		3·1004, **sidebone**, a	3·10042, sound, 3		
			3,10043, sound, 3		
			3·10044, sound, 3		
			3·10045, sound, 3		
			3·10047, sound, 3		
			3·10048, sound, 5		
			3·10049, sound, 5		
			3·100401, sound, 3		
			3·100402, sound, 5		
			3·100403, sound, 3		
			3·10041, **sidebone**, 4		
			3·10046, **sidebone**, 3		
			3·100404, **sidebone**, 5		
		3·1005, not examined	3·10052, sound, 3	3·100523, sound, 4	
				3·100522, sound D.A.P. 3	
				3·100521, sound D.A.P. 4	
			3·10054, sound, 4		
			3·10053, not examined	3·100533, sound, 5	
				3·100531, **sidebone**, 3	
				3·100532, **sidebone**, 4	
				3·100534, **sidebone**, 4	
			3·10056, not examined	3·100561, **sidebone**, 4	
			3·10058, sound, 3		
			3·10057, **sidebone**, 4		
			3·10059, **sidebone**, 3		
			3·10055, sound, 6		
		3·1006, not examined	3·10061, **sidebone, ringbone**, a		
		3·1007, sound, 9	3·10071, sound, 5		
			3·10072, sound, 5		
		3·1008, not examined	3·10081, not examined	3·100811, sound, 3	
			3·10082, not examined	3·100821, sound, 4	

FAMILY 3—*continued.*

3	3·1, not examined —*contd.*	3·1009, not examined	3·10091, not examined	3·100911, **sidebone**, 5	
		3·10001, not examined	3·100011, sound, 11		
			3·100012, **sidebone**, 9		
			3·100013, **sidebone**, a		
			3·100014, **sidebone**, a		
		3·10002, not examined	3·100021, not examined	3·1000211, not examined	3·10002111, sound 3
					3·10002112, **sidebone**, 3
		3·10003, not examined	3·100031, sound, 5	3·1000311, sound, 2	
		3·10004, not examined	3·100041, **sidebone**, 6		
		3·10005, not examined	3·100051, sound, 3		
		3·10006, not examined	3·100061, **sidebone, ringbone**, 4		
		3·10007, not examined	3·100071, **sidebone**, 3		
	3·2, not examined	3·21 not examined	3·211, sound, 3		
			3·212, sound, 3		
		3·22, not examined	3·221, not examined	3·2211, sound, 4	
				3·2212, sound, 7	
				3·2213, sound, 3	
				3·2217, sound, 3	
				3·2218, sound, 3	3·22181, sound, 4
				3·2214, **sidebone**, 6	
				3·2215, **sidebone**, 3	
				3·2216, **sidebone**, 3	3·22161, sound, 5
					3·22162, sound, 5
				3·2219, **sidebone**, a	
		3·23, sound, a	3·231, not examined	3·2311, **sidebone**, 3	
		3·24, not examined	3·241, sound, 3		
		3·25, not examined	3·251, not examined	3·2511, sound, 3	
			3·252, not examined	3·2521, sound, 3	
				3·2522, sound, 3	
				3·2523, sound, 4	
		3·26, not examined	3·261, **sidebone**, a		
		3·27, sound, a	3·271, sound, 3	3·2711, **ringbone**, 3	
			3·272, sound, 3	3·2721, sound, 5	
			3·273, sound, 4		
			3·274, sound, 3		
			3·275, sound, 4		
	3·3, not examined	3·31, sound, 4	3·311, **sidebone**, 4		
			3·312, **sidebone**, 3		
		3·32, **sidebone**, 7	3·321, sound, 6	3·3211, sound	
				3·3213, sound, 3	
				3·3214, sound, 2	
				3·3216, sound, 3	
				3·3215, sound D.A.P., 3	
				3·3212, sound D.A.P., 4	
				3·3217, **ringbone**, 3	
			3·322, sound, 4		
		3·33, sound, 5			
		3·35, sound, 5			
		3·37, sound, 3			
		3·38, sound, 5			
		3·39, not examined	3·391, bog spavin, 3		
		3·301, sound, 5	3·3011, **sidebone**, 3		
		3·302, not examined	3·3021, sound, 3		
		3·34, **sidebone**, 5	3·341, sound, 3		
			3·343, sound D.A.P., 3		
			3·342, **sidebone**, 3		
		3·36, **sidebone**, 5	3·363, sound, 4		
			3·364, sound, 4		
			3·361, sound D.A.P., 3		
			3·362, **sidebone**, 4		
	3·4, not examined	3·41, Shiverer, 11	3·411, sound, 3		
			3·412, sound, 3		
			3·413, sound, 5		
			3·414, sound, 5		
			3·415, sound, 5		
			3·416, sound, 3		
			3·417, sound, 3	3·4171, sound D.A.P., 5	
			3·419, sound, 3		
			3·4102, sound, 5		
			3·4101, sound D.A.P. 6		
			3·418, roarer, 5		

FAMILY 3—*continued.*

3	3·4, not examined —*contd.*	3·42 sound, 5		
		3·43 sound, 5	—3·431, sound, 3	
		3·44, not examined	—3·441, sound, 3	
	3·5, not examined	—3·51, sound, 4		
	3·6, not examined	—3·61, **sidebone,** 5		
	3·7, not examined	—3·71, not examined	3·711, not examined	—3·7111, sound, 5
			3·712, not examined	—3·7121, **sidebone, 6**

FAMILY 4.

This family shows a considerable amount of unsoundness, more particularly in the descendants of 4.1, which is the main representative, and 32 per cent. unsoundness is revealed in his progeny, as hereunder:—

TABLE SHOWING UNSOUNDNESS IN FAMILY 4.

Sires.	Sons.		G Sons.			GG Sons.			GGG Sons.			GGGG Sons.			GGGGG Sons.			Total.		
	Examined.	Unsound.	Examined.	Unsound.	Percentage.	Examined.	Unsound.	Percentage.	Examined.	Unsound.	Percentage.	Examined.	Unsound.	Percentage.	Examined.	Unsound.	Percentage.	Examined.	Unsound.	Percentage.
4·1 ..	..	..	5	3	60·0	14	5	35·7	45	16	35·5	22	4	18·1	..	..	..	86	28	32·5
4·2 ..	..	..	..	..	..	..	..	..	4	..	..	1	..	..	..	..	..	5	..	..
4·3 ..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..
4·4 ..	..	..	..	..	..	..	..	..	2	..	..	4	..	..	7	3	42·8	13	3	23·0
Total ..	1	..	5	3	60·0	14	5	35·7	51	16	31·4	27	4	14·8	7	3	42·8	105	31	29·4

It is possible that a considerable amount of this unsoundness has been introduced through the female side, for in the first branch of the family, through 4.11, we find:—

4.1112 was from a mare by a son of 22.

4.11151 was from a mare by a son of 22.1, and the granddam by the same son of 22 as in the preceding pedigree.

In other branches—

4.124 was from a mare by 2.1, and the granddam was by 1.

4.125 was from a mare by 22.

4.1271 was from a mare by a grandson of 3.

4.1315 was from a mare by 22.

4.12641 was from a mare by a grandson of 1.

4.12645 was from a mare by a grandson of 1.

4.12911 was from a mare by 17.2211, which was sound, but whose sire was unsound.

4.12917 was from a mare by a grandson of 3, and the granddam was by 22.

4.13121 was from a mare by a son of 22.

4.13162 was from a mare by 1.1.

4.128115 was from a mare by 3.101.

Consequently, in a large number of cases, at least it can be shown that the chief cause for unsoundness was present with the dams, if they were not actually responsible for its introduction into the family.

22, which appears so frequently in the above pedigrees, and is so often seen in unsound lines, is related to 1, as shown in the following outline:—

Not examined ..	Not examined, 1		
	Not examined—	Not examined—	Not examined, 22

In the last branch of this family, viz., 4.4, it is probable that its unsoundness was introduced through the dams, for 4.4112311 was from a mare by 1.33, and the granddam by 38. Other unsound members of this family cannot be traced through their dams to any horse recorded in these tables.

4.2111 appears as the sire of a number of mares, which, though mated with sound stallions, threw unsound progeny.

FAMILY 4.

4	4·1, not examined	4·11, not examined	4·111, not examined—	4·1111, sound, 5	4·11111, sound, 4	
				4·1112, **sidebone**, 4	4·11121, **sidebone**, 5	
				4·1113, sound, 4		
				4·1114, sound, 3		
				4·1115, not examined—	4·11151, **sidebone**, 4	
			4·112, sound, 10	4·1121, **sidebone**, 3		
		4·12, not examined	4·121 sound 8—	4·1211 sound, 4		
			4·122, not examined—	4·1221, not examined—	4·12212, sound, 4	
					4·12213, sound, 3	
					4·12214, sound, 4	
					4·12215, sound, 5	
					4·12216, sound, 3	
					4·12217, sound, 3	
					4·12211, **sidebone**, 4	
				4·1222, not examined	4·12221, sound, 4	
				4·1223, sound, 3		
			4·123, **sidebone**, 8	4·1231, sound, 3		
			4·124, **sidebone**, 7			
			4·125, **sidebone**, a			
			4·126, not examined—	4·1261, not examined—	4·12611, sound, 3	
					4·12612, sound, 3	
					4·12613, sound, 5	4·126131, sound, 4
					4·12614, sound, 3	4·126141, sound, 5
						4·126142, sound, 5
						4·126143, **ringbone**, 3
				4·1262, not examined	4·12621, sound, 3	
				4·1263, not examined	4·12631, sound D.A.P. 4	
				4·1264, not examined—	4·12642, sound, 4	
					4·12643, sound, 4	
					4·12641, **sidebone**, 4	
					4·12644, **sidebone**, 3	
					4·12645, **sidebone**, 5	
			4·127, not examined—	4·1272, sound, 5		
				4·1273, sound, 3		
				4·1271, **sidebone**, 5	4·12711, sound D.A.P. 3	
			4·128, not examined	4·1281, not examined	4·12811, not examined	4·128111, sound, 3
						4·128112, sound, 3
						4·128113, sound, 5
						4·128114, sound, 2
						4·128116, sound, 3
						4·128117, sound, 5
						4·128115, **sidebone**, 5

FAMILY 4—*continued.*

- 4
  - 4·1, not exam'd. —*contd.*
    - 4·12, not exam'd. —*contd.*
      - 4·129, not examined
        - 4·1291, sound, 4
          - 4·12913, sound, 5
          - 4·12914, sound, 6
          - 4·12916, sound, 3
          - 4·12918, sound, 3
          - 4·12919, sound, 5
            - 4·129191, sound D.A.P. 3
          - 4·12911, **sidebone, 4**
          - 4·12912, **sidebone, 4**
          - 4·12915, **sidebone, 3**
          - 4·12917, **sidebone, 5**
        - 4·1292, not examined
          - 4·12921, sound, 6
    - 4·13, not examined
      - 4·131, not examined
        - 4·1311, not examined
          - 4·13111, sound, 3
        - 4·1312, not amined
          - 4·13121, **sidebone, 5**
        - 4·1313, not amined
          - 4·13131, not amined
            - 4·131311, sound, 5
          - 4·13133, sound, 3
          - 4·13132, **sidebone, 5**
        - 4·1314, **sidebone, 7**
          - 4·13143, not examined
            - 4·131431, sound, 3
          - 4·13142, sound, 3
          - 4·13141, **sidebone, 2**
        - 4·1315, **sidebone, ringbone, a**
          - 4·13151, **sidebone, 3**
        - 4·1316, not examined
          - 4·13161, sound, 3
          - 4·13163, sound, 7
          - 4·13162, **sidebone, 8**
          - 4·13164, **sidebone, a**
            - 4·131641, **sidebone, 3**
        - 4·1317, not examined
          - 4·13171, sound, a
            - 4·131711, sound, 3
            - 4·131712, sound, 3
            - 4·131713, sound, 3
            - 4·131714, sound, 5
            - 4·131715, sound D.A.P., 3
          - 4·13172, not examined
            - 4·131721, sound, a
      - 4·132, not examined
        - 4·1321, sound, a
      - 4·133, not examined
        - 4·1331, not examined
          - 4·13311, not examined
            - 4·133111, **ringbone**
  - 4·2
    - 4·21, not examined
      - 4·211, not examined
        - 4·2111, not examined
          - 4·21111, sound, 3
          - 4·21112, sound
            - 4·211121, [sound, 3
        - 4·2112, not examined
          - 4·21121, sound, 5
          - 4·21122, sound, 3
  - 4·3, not examined
    - 4·31, sound, 8
  - 4·4
    - 4·41, not examined
      - 4·411, not examined
        - 4·4111, not examined
          - 4·41111, sound, a
          - 4·41112, sound, 10
        - 4·4112, not examined
          - 4·41121, not examined
            - 4·411211, sound, 5
          - 4·41122, not examined
            - 4·411221, sound, 3
          - 4·41123, not examined
            - 4·411231, sound, 6
            - 4·411231, sound, 5
              - 4·4112311 **sidebone, 4**
          - 4·41124, not examined
            - 4·411241, not examined
              - 4·4112411 **sidebone, 6**

FAMILY 4—*continued.*

4	4·4—*con.*	4·42, not examined.	4·421, not examined	4·4211, not examined	4·42111, not examined	4·421111, not examined —	4·4211111, sound, 4
							4·4211112, sound, 3
							4·4211113, sound, 3
							4·4211114, **side-bone**, 3
						4·421112, not examined	4·4211121, sound, 6

FAMILY 5.

Very few members of this family have been recorded, but as some of the sires appear in dams' pedigrees, the table is reproduced.

The only comment necessary is that 5.11112 was from a mare whose sire was probably 1.3311, a defective horse; while the dam of 5.11113 was probably by 9.3127, a sire of unsoundness.

FAMILY 5.

5	5·1, not examined	5·11, not examined	5·111, not examined	5·1111, not examined—	5·11111, sound, 2		
					5·11114, sound, 7		
					5·11112, **side-bone,** 4		
					5·11113, **side-bone,** 3		
					5·11115, sound D.A.P.		
				5·1112, sound D.A.P.—	5·11121, sound D.A.P. 6		
					5·11122, sound, 4		
					5·11123, **side-bone,** 4		
				5·1113, sound D.A.P. a			
				5·1114, not examined	5·11141, sound, 3		
				5·1115, not examined	5·11151, not examined	5·111511, **side-bone,** a	5·1115111, Th. Pin

FAMILY 6.

This is another short family. It is divided into two branches, 6 and 6A, related to one another as follows:—

Not examined ..	Not examined	Not examined	Not examined, 6
	Not examined	Not examined	Not examined, 6A

From a study of the tables, one is led to believe that the family is sound, though there are not sufficient members recorded, nor can the pedigrees through the dams of the unsound ones be traced far enough, to allow of a definite pronouncement. In the progeny of 6.11, a number of mature horses are seen which are sound, and the only unsound one is a three-year old—possibly the mare is responsible for this.

The dam of 6.1211 was most probably by 9.128, an unsound horse, and the dam of 6.13 was by a son of 3.

6.14111 was from a mare by a half-brother of 1.

6A is evidently a sound line, for most of the horses examined were aged, and only one was unsound, viz., 6A.116. In this case, the dam was by an unrecorded horse, and the granddam by 3.1; so there is sufficient reason for the appearance of unsoundness here.

The full table is as follows:—

FAMILY 6.

6	6·1, not examined—	6·11, not examined—	6·111, sound, 3		
			6·112, sound, 7		
			6·113, sound, 5		
			6·114, sound, 3		
			6·117, sound, 5		
			6·118, sound, 3		
			6·119, sound, 5 —	—6·1191, sound D.A.P., 4	
			6·1102, sound —	—6·11021, sound, 5	
			6·1103, sound, 4		
			6·115, sound D.A.P. 4		
			6·116, sound D.A.P. 6		
			6·1101, **sidebone**, 3		
		6·12, not examined—	6·121, not examined	6·1212, sound, 3	
				6·1211, **sidebone**, 3	
			6·122, sound, 3 —	—6·1221, sound D.A.P., 3	
		6·13, **ringbone, sidebone**, a—	6·132, sound, 3		
			6·131, **sidebone**, 3		
			6·133, **sidebone**, a —	—6·1331, sound, 5	
		6·14, not examined—	—6·141, not examined	—6·1411, not examined	—6·14111, **sidebone**, 3
		6·15, not examined—	6·152, sound, 4		
			6·154, sound, 3		
			6·151, **sidebone**, 3		
			6·153, **sidebone**, 4		
		6·16, not examined—	6·161, sound, 3		
			6·162, sound, 3		
	6·2, not examined	—6·21, not examined—	6·211, sound, 3		
			6·212, sound, 3		
	6·3, not examined—	6·31, **sidebone**, 5			
		6·32, not examined—	—6·321, sound, 3		
	6·4, not examined	—6·41, not examined—	—6·411, sound, 5		
	6·5, not examined—	6·51, not examined—	—6·511, sound, 4		
		6·52, not examined—	—6·521, sound, 3		
	6·6, not examined—	—6·61, sound, a —	6·612, sound, 3		
			6·613, sound D.A.P., 3		
			6·614, sound D.A.P., 7		
			6·611, **sidebone**, 5		
6A	6A·1, not examined—	6A·11, not examined—	6A·111, not examined—	—6A·1111, sound, 11	
			6A·113, sound, 8 —	—6A·1131, sound D.A.P., 4	
			6A·115, sound, a		
			6A·117, sound, a		
			6A·118, not examined—	—6A·1181, sound, 4	
			6A·112, sound D.A.P., 11		
			6A·114, sound D.A.P., 4		
			6A·116, **sidebone**, a		
		6A·12, sound D.A.P., a			
	6A·2, not examined	—6A·21, not examined	—6A·211, sound, 5 —	6A·2111, sound D.A.P., 4	

(*To be continued.*)

"BLACK SPOT" AND "LEAF CURL."

(*W. Laidlaw, B.Sc., Biologist; and C. C. Brittlebank, Vegetable Pathologist.*)

During the last four seasons experiments have been carried out for the purpose of testing the efficacy of different sprays on "Black Spot" of the apple and "Leaf Curl" of the peach, and also to ascertain the most effectual time for their application.

Row of Statesman—sprayed Twice.

Experiments during the first two seasons were made at the orchards of Mr. C. Nickell, at Drouin, and at Mr. Peart's, Picnic Point, Bairnsdale, but subsequent tests have been conducted entirely at Drouin. These orchards are very liable to the attacks of "Black Spot" and "Leaf Curl." The former because of the high rainfall of the district and the retentive nature of the subsoil, the latter owing to the situation of the orchard on rich river flats where it is impossible to culitvate, as periodic floods wash away the soil. Ideal conditions exist, therefore, at both places for the growth of fungoid pests. Clover, grass, &c., springs up very luxuriantly, as will be seen from the photographs, and this vegetation, together with the heavy dews and river mists, keeps up a dampness favorable to the development and spread of fungus.

At the start of our experiments, the following mixtures were used, viz.:—

Bordeaux, 6.4.40;
Copper soda, 6.8.40;
Lime sulphur, 1 in 9; and
Acetate of copper (verdigris), 3 lbs. to 40 gallons of water;

and all the mixtures were carefully prepared and tested. We would point out to growers the importance of testing their spray mixtures, as acid mixtures are very liable to burn, and russeting is largely due to their use.

It is unnecessary to give details of all the tests, nor would it be of any educational value.

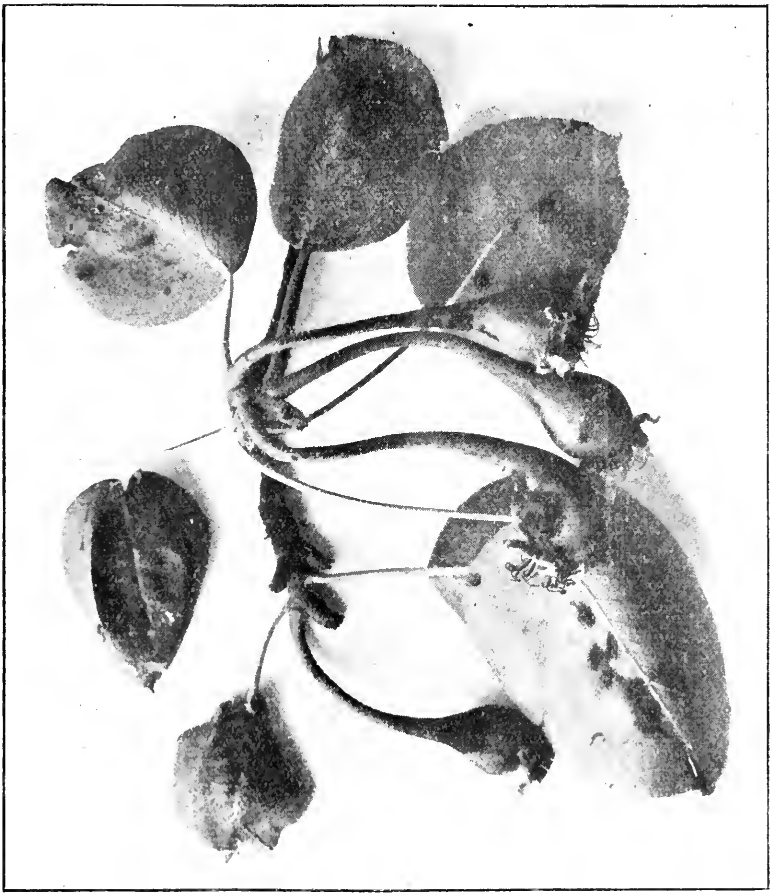
Spraying a Pear Tree for the Second Time.

In conducting experiments of any kind in the field, it is absolutely essential to extend them over a series of years before any conclusions can be drawn from them, as so many factors have to be considered; and, though we know we have not exhausted the subject, our results on "Leaf Curl" have been so uniformly good since the commencement, and as those on "Black Spot" have been improving all the time, we feel justified, owing to our excellent results last season (1917-18) in giving a short paper on the subject.

Leaf Curl of the Peach.

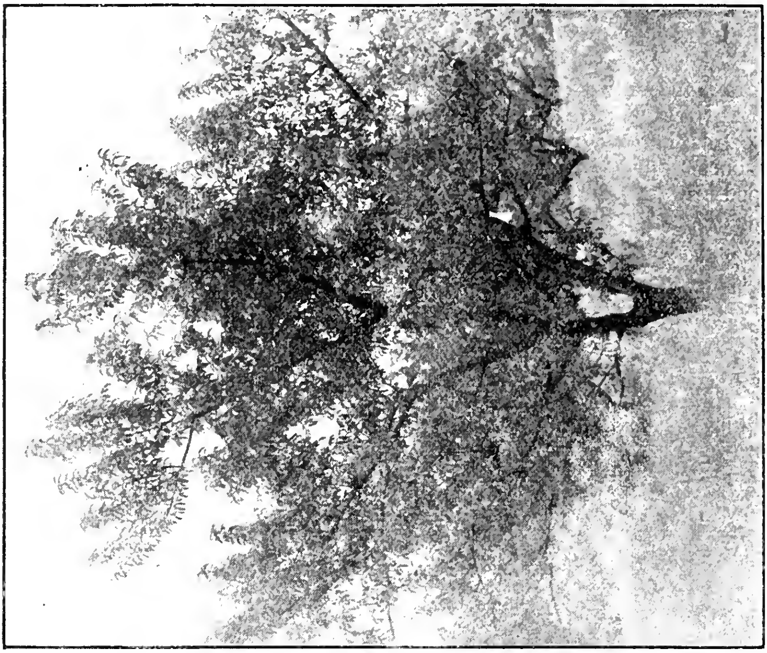
(*Exoascus Deformans—Berk, Fck*).

When we took this disease in hand, a number of trees in Mr. Peart's orchard had succumbed to the continued defoliation. On our first visit to Mr. Nickell's, we found a team of bullocks pulling the trees out, and on asking the reason, were told that the trees were of no use, as they bore no fruit, and were gradually dying. The rooting out was stopped on our advice, and with the happiest results.

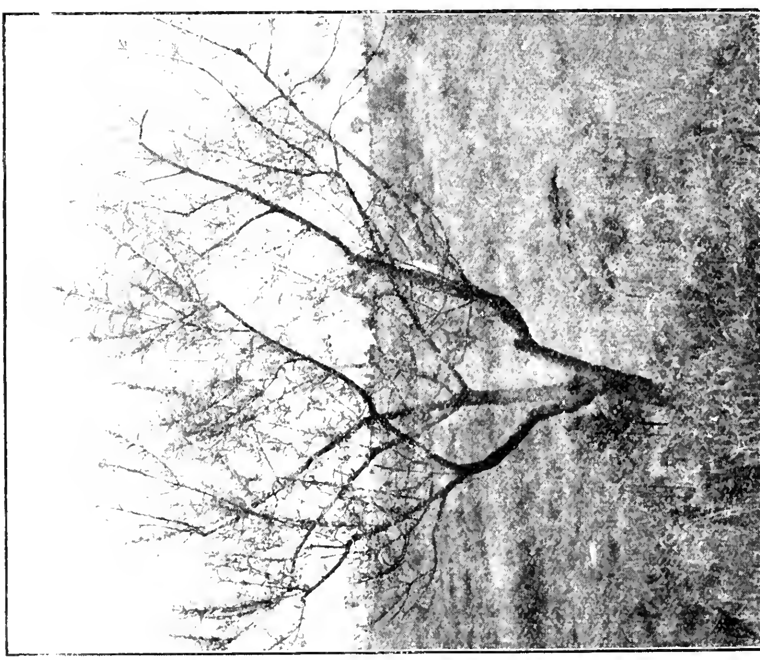


Cutting from a Pear Tree which was not sprayed.

Mr. Peart wrote on the 11th January, 1914, that peach and apricot trees sprayed with verdigris were quite free from curl, as were those which had been sprayed with copper soda. Bordeaux mixture did not give quite such good results as the two previous sprays, and lime sulphur, though it cleaned all lichens from the trees, was not a success as far as the "Leaf Curl" was concerned.



Peach Tree—sprayed.



Peach Tree—which was not sprayed.

Peach Tree at Pic-nic Point—not sprayed.

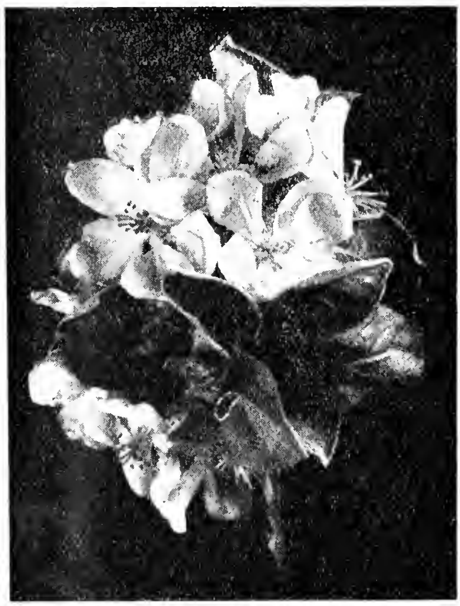
Peach Tree at Pic-nic Point—sprayed.

Though the results obtained from acetate of copper were excellent, the high price of the material compelled us to abandon the tests with it. Experiments were continued with Bordeaux and copper soda, the latter always giving better results than the Bordeaux; in fact, during the last three seasons, we have used copper soda exclusively for "Leaf Curl," and with excellent results at both orchards.

The Time to Apply.

By spraying the trees just before or when the earliest buds are showing pink, "Leaf Curl" can be cured. The mixture used with complete success was copper soda, 6.8.40.

Jonathan Blossom — shows when first spraying should be made.



Jonathan Blossom—shows when second spraying should be made.

Black Spot of Apple.

(*Venturia inaequalis* (*Cke*) *Aderh—formerly known as Fusicladium dendriticum*).

Experiments in the treatment of Black Spot were made on six different varieties, all of which are commonly grown throughout the State.

The disease, as before mentioned, was very prevalent in the orchards where the experiments were conducted, in wet years the bulk of the apple and pear crops being so badly affected as to be unsaleable.

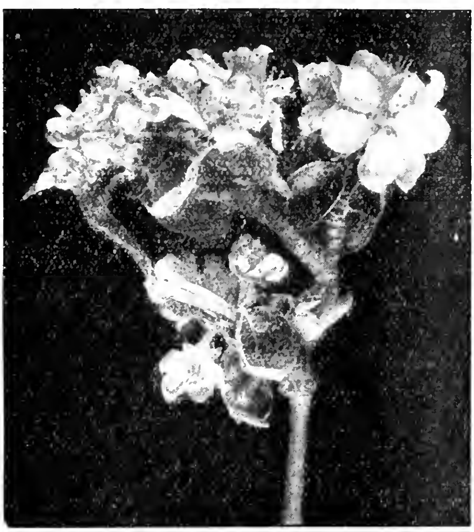
The past season's rainfall was above the average at Drouin (see table on page 488). The spraying season, September and October, was exceptionally wet. During these months there were 43 wet days and 11½ inches of rain fell. Notwithstanding this excessive rainfall, the experiments were very successful, as will be seen from the results.

Last season we confined our experiments to the lime sulphur spray principally, using the commercial product. Three different brands were

used, and each gave equally good results. The cost of material works out at threepence (3d.) per tree.

The dates on which the different varieties were sprayed are given below, not as a guide, but as showing the time when the buds were more green than pink, which was the condition of the trees when the first spray was applied. The second spray was given when the centre flowers of the blossom cluster were fully open. (See photographs on page 484-5).

Statesman Blossom—when first spray should be applied.



Statesman Blossom—when second spray should be applied.

We are of opinion that the time of spraying is more important than the fungicide used, provided the mixtures are properly made and tested. While making this statement, we must point out that the result obtained from lime sulphur last season was very much better than that obtained from Bordeaux, 6.4.40. The foliage looked healthier, and remained longer on the trees; the skin of the fruit had a better colour, and was clearer and sappier looking.

We would like to impress on growers the necessity of having all the cultivation done before spraying is commenced. The reason for this is that the resting spores have developed in the fallen diseased leaves of the previous season, reaching maturity at the time the apple and pear trees are coming into bloom. Under favorable weather conditions, they are thrown out in countless numbers, and are carried by air currents into the young leaves and fruits, where they germinate and infect the crop. Cultivation should not be resumed till all danger of infection is past. This period will vary in different districts and under different weather conditions.

In conclusion, we would express our thanks to Mr. C. Nickell and to Mr. L. Pilloud, Orchard Supervisor, for their interest in the experiments, and for the careful way in which they carried out the spraying, picking, and grading, and also for the many suggestions made by them, which helped to make the work so pronounced a success.

Hereunder are details of the yields obtained from the apple trees upon which the experiments were made:—

Jonathans.

18 trees sprayed with lime sulphur—

1st spraying, 1 in 12, on 19.9.17.
2nd spraying, 1 in 30, on 1.10.17.

First picking on 27.2.18 gave—
22 cases clean and good;
4 apples with slight spot, but marketable;
16 apples with black spot, but marketable;
9 cases of windfalls, all good.

Second picking on 21.3.18—
46 cases good and clean;
20 apples with black spot;
3 apples with codlin moth;
2 cases windfalls, all clean.

1 Jonathan tree sprayed once, 1 in 12, on 19.9.17:

Picked 21.3.18—
4 cases clean and good;
39 apples with black spot;
5 apples with black spot, but marketable;
2 apples with codlin moth;
1 case windfalls, all good.

Jonathan check tree—no spray:

Picked 21.3.18—
1 case of marketable, slightly marked with black spot;
4 cases badly spotted, unmarketable.

The average number of Jonathan apples to the case was 186.

London Pippins.

5 trees sprayed with lime sulphur (4 trees sprayed twice and one tree sprayed once only)—

1st spraying, 1 in 15, on 8.10.17.
2nd spraying, 1 in 35, on 16.10.17.

Picked 4 trees on 17.4.18—
64 cases all clean, no seconds or spotted apples.

1 tree sprayed once, 1 in 15, on 8.10.17.

Picked on 17.4.18—
13 cases all good, no seconds or spotted apples.

Check tree, sprayed once, 1 in 35, on 16.10.17—
12 cases all spotted, 4 cases good apples.

Rome Beauty.

3 trees sprayed with lime sulphur—

1st spraying, 1 in 15, on 8.10.17.
2nd spraying, 1 in 35, on 16.10.17.

Picked on 1.5.18—

22 cases, all clean and good.

Statesman.

18 trees sprayed with lime sulphur—

1st spraying, 1 in 12, on 19.9.17.
2nd spraying, 1 in 30, on 1.10.17.

Picked on 24th and 25th April, 1918—

64 cases all good, no spot;
26 cases slightly spotted, marketable;
4 cases unmarketable.

Check tree—

1 case good;
7 cases black spot, unmarketable.

Rokewood.

18 trees sprayed with lime sulphur—

1st spraying on 4.9.17.
2nd spraying on 21.9.17.

Picked on 30.5.18. (Owing to the wet weather, the Rokewoods were far too late in being picked, the bulk of the crop having fallen on the above date.)

72 cases picked from ground and off the trees—

18 cases no spot;
54 cases spotted and cracked, the cracks on account of the fruit being left too long before picking.

Yates.

1 tree sprayed with lime sulphur—

1st spraying, 1 in 15, on 4.9.17.
2nd spraying, 1 in 15, on 19.9.17.
3rd spraying, 1 in 30, on 26.9.17.

Picked on 25.5.18—

5 cases clean and good;
$\frac{1}{4}$ case spotted.

Check tree, sprayed once, 1 in 15, on 4.9.17—

All apples more or less spotted, only 110 apples left on tree, leaves affected, and tree partially defoliated.

RAINFALL AT DROUIN WEST

During the Ten Years 1908 to 1917 (both inclusive).

Year.	No. of days on which rain fell during year.	Total rainfall during year.
		Points.
1908	165	30·02
1909	186	41·48
1910	193	38·15
1911	189	48.84
1912	191	36·22
1913	188	42·90
1914	151	30·10
1915	190	35·68
1916	198	46·34
1917	202	47·61
	1,853	397·34
Yearly average for ten years	185	Yearly average for ten years } 39·73

Rainfall During Each Month of the Year, 1917–18.

Month.	No. of days on which rain fell during month.	Total rainfall for month.
		Points.
June, 1917	19	4·64
July, 1917	26	4·78
August, 1917	18	4·53
September, 1917	22	4·82
October, 1917	21	6·68
November, 1917	13	2·78
December, 1917	7	3·37
January, 1918	9	2·24
February, 1918	9	·99
March, 1918	14	6·10
April, 1918	15	1·90
May, 1918	19	7·67
Total number of days on which rain fell during the year .. or 7 days over the average for ten years	192	
Total rainfall for twelve months ended 31st May, 1918 .. or 10·77 points over average for ten years	..	50·50

THE CULTURE OF THE TRUE LAVENDER.

By Ed. Zaccharewicz, Director of the Agricultural Service of the Department of Vaucluse, France.

(Translated by Francois de Castella, Government Viticulturist, and W. Percy Wilkinson, F.I.C., Commonwealth Analyst.)

[In the *Revue de Viticulture,* Paris, 4th April, 1918, the results of a detailed study on methods of cultivation for true lavender were communicated by Monsieur Ed. Zaccharewicz. As much attention is at present being devoted, *inter alia,* to the project for extensive cultivation of lavender, by the Victorian Scent and Essential Oils Association, it is hoped that a translation of the recent French studies on this subject may be opportune.]

The present description of lavender culture is intended to meet the wishes of numerous agriculturists, who desire to take advantage of post-war conditions in order to render productive land where no other culture can be successfully undertaken. The true lavender* enables uncultivated, hilly, or mountainous land to be profitably utilized, since this plant is not exacting as regards depth or fertility of soil.

The class of soil which suits the lavender best is a light and sandy clay, stony, well exposed to the sun, at an elevation of 1,200 to 4,000 feet. It is noticeable that at a lower altitude true lavender yields an essential oil poor in ester; it would also have a tendency to degenerate in the direction of spike lavender, whereas, on the contrary, the higher the altitude the richer (in ester) is the essential oil yielded by the true lavender, which reaches its maximum value at 3,000 feet.

Experiments with artificial manures, which will be described subsequently, enable us to affirm that, even at lower elevations, soils, which by their nature are suitable for this culture, can be rendered fertile and profitable if judiciously manured. Artificial fertilizers have an action on the quality of the oil and on the growth of the plant, conditions which are necessary to prevent degeneration.

True lavender (*Lavendula vera*) must not be confounded with spike (*Lavendula aspica*). True lavender is a small woody plant which bears numerous upright herbaceous branches, with undivided sessile pointed leaves, covered with a whitish down when young. The flowers are arranged in glomerules, grouped in a sort of compound head.

The essential oil of true lavender is slightly yellow in colour, has a sweet aromatic odour, is rich in ester, and possesses an acrid flavour.

Spike lavender differs from true lavender by its larger leaves, broader bracts, more numerous branches, more powerful but less agreeable odour. The essential oil it yields is known commercially as oil of spike.

In the course of inspections made in the Department of Vaucluse, we have been able to collect interesting notes concerning the culture of true lavender. One of the estates where this plant is carefully cultivated is situated in the Commune of Lagarde; it is under the management of Monsieur Clement, is of 150 acres in extent, and is situated at an elevation of 2,500 feet; it is surrounded by the mountainous spurs of Mount Ventoux; it is on these mountains that true lavender grows wild, and it is here that it yields a highly esteemed essential oil.

* *Lavendula vera* as distinguished from other species.

It has been shown that by means of cultural operations conducted at the proper moment, in these soils where pebbles predominate, the growth and flowering of the plants can be increased. On this class of country, where lavender grows wild occupying the whole surface, the land has been worked during March with the *araire** in such a manner as to only leave narrow strips of lavender 3 feet apart. Thus treated the plants situated on the strips grow strongly, and yield twice as much as uncultivated land. Observation of the superior growth of plants bordering roads, in fact, suggested cultivation on these lines.

The araire has been replaced by the spring-tooth cultivator (*houe canadienne*) which enables the land to be worked several times, before winter and again in the month of March (September in Australia). The last working should not be too late, so as to avoid damaging young roots.

Simultaneously with these workings, artificial manures have been applied experimentally with most satisfactory results. Analyses showed that the soil is relatively rich in nitrogen, but below the average in potash and phosphoric acid. This relative abundance of nitrogen is the result of the accumulation, during centuries, of organic matter resulting from plant *débris*.

The manure dressings were mixed in the following proportions:—

Nitrate of soda, 20 parts.
Chloride of potassium, 20 parts.
Superphosphate (18-20 per cent.), 60 parts.

Four hundred and fifty pounds per acre of this manure were broadcasted between the rows before the March (September here) ploughing. Striking differences were noted between the manured and the control plots both as regards growths and yield of flowers.

The control under ordinary cultural conditions yielded an average of over 2,000 kilos of lavender flowers per hectare (about 18 cwt. per acre); the manured part reached a yield of 3,500 kilos per hectare (about 31½ cwt. per acre). In other words, an additional 13½ cwt. per acre.

Mr. Clement distilled the two lots of flowers separately, with the following results:—100 kilos† of control lavender gave an average yield of 600 grammes of oil; 100 kilos of lavender flowers from the fertilized plots yielded, on an average, 800 grammes of oil. The yields per hectare (2½ acres) were as follows:—Unmanured lavender, 12 kilos of oil; lavender with fertilizer, 28 kilos of oil. Prices averaged from 10 to 12 frs. per kilo of oil. But increasing demand having enhanced the price, this hardened as follows:—In 1904, 20 frs.; in 1905, 32 frs.; until it reached, in 1912, the remarkably high price of 40 frs. Since then prices have been maintained at from 35 to 40 frs. per kilo of oil.

Prior to 1904, the value of the crop was—per hectare, without manure, 12 kilos of oil, at from 10 to 12 frs. per kilo, say, 120 to 144 frs. In 1904, the value rose, as the result of enhanced prices, to $12 \times 20 = 240$ frs.; in 1905, $12 \times 26 = 312$ frs.; in 1906, $12 \times 32 = 384$ frs.; and in 1912, $12 \times 40 = 480$ frs. Hence, the gross return of lavender without fertilizer may reach 480 frs. per hectare, owing to increased commercial value of the oil. But far more

* The *araire* is the old Roman wooden plough with a steel point and no mould-board.
† 1 kilogram = 2.2 lbs. avoirdupois; 28.4 grammes = 1 oz.

remunerative results may be obtained by the application of fertilizers suitable for this crop.

Before 1904, with fertilizer, the yield was 28 kilos of oil per hectare, with a value of 10 to 12 frs. per kilo, say, 288 to 336 frs.; as the result of enhanced value of the oil, the gross returns reached, in 1912, the figure of 1,120 frs. per hectare. According to these figures, the action of artificial fertilizers has more than tripled the returns.

Mr. Clement, in reporting these results, added that, in the case of the crop gathered from the fertilized land, the flowers were better developed and more numerous than on the control plots; the oil suffered no diminution in quality; in his opinion, it showed higher quality, and commanded, consequently, a better price. In these tests, self-sown lavender was experimented with. The question arises whether it would be possible to successfully establish plantation fields of lavender. In our opinion, what has already been achieved as regards truffle culture would be equally feasible in the case of lavender.

As we have already shown, land planted to lavender might be situated at a lower altitude than that which has hitherto been considered indispensable for this culture, provided that the soils fulfil conditions which lavender culture requires.

A lavender plantation may be established either from slips or from seed; slips may be planted out either in autumn or in spring. If the land is at a high altitude, spring planting is to be preferred, owing to cold winter spells. In the case of seed, this may be sown equally successfully either in autumn or spring. Where the winters are mild, autumn sowing is to be preferred.

Opinions differ concerning the merits of propagating lavender from seed or from slips. Slips grow quicker than seeds, and may yield in the first year under suitable climatic conditions; this depends also on the plants; young ones are much to be preferred to old ones; but plants cost three times as much as seeds, as will be shown later.

Slips are planted in rows about 3 feet apart, with the plants 2 feet apart in the row. In other words, about 16,600 plants per hectare. Slips are planted with the dibble. Seeds are likewise sown in rows about 3 feet apart, treatment being the same as in the case of carrot seed, it being buried about 1 inch deep. About 1 oz. of seed is sown per square metre; this is equivalent to 10 kilos of seed per hectare (9 lbs. per acre).

The land should receive two workings; one at the beginning of winter, and another in March (September in Australia); advantage is taken of the latter to turn in the fertilizer broadcasted between the rows. The harvest commences on the 1st of August (1st of February in Australia), and finishes about the beginning of September (March in Australia). In the Department of Vaucluse, pickers come at harvest time from the neighbouring Department, and are paid at the rate of 7 frs. per 100 kilos of flowers gathered with the stems (£2 16s. per ton). A picker can gather about 130 kilos of lavender flowers per day.

Gathering is not carried out if the plants are wetted by rain, as the flowers then yield less oil; absence of sun and excess of water do not favour the production of oil in the flower. As the flowers are brought in from the farm, distillation proceeds. Distillation is carried out in the open air in a still with a boiler capacity of from 4 to 8 cwt. of

flowers. Distillation is conducted in a current of steam. The flowers are placed loosely in a perforated cylinder of slightly smaller diameter than the boiler of the still; the cylinder is supported by three vertical iron rods, rather shorter than the depth of the boiler; these rods converge above, so that the whole (cylinder) may be lifted out of the boiler by means of block and tackle after distillation is completed. A tripod is placed in the boiler to support the perforated cylinder, the base of which just touches the water. On boiling, the steam which is generated passes through the flowers, carrying the oil with it. It then passes trough a worm cooled with water, and, on condensation, is caught in a separating receiver. The apparatus once under way, is operated day and night. It is, of course, necessary to have a sufficiently large staff, so that fresh flowers may be supplied to the boiler as fast as the spent flowers are removed.

Complete figures are given in the original showing the costs of establishment of a lavender plantation, manuring, distillation equipment, &c. As Australian conditions differ so greatly from those in France, these details of costs, &c., have not been reproduced. From the detailed statement a few extracts will, no doubt, prove of interest.

On a properly planted and manured lavender field the following yields could be expected:—Second year, 1,800 lbs. of flower tops, yielding 12 lbs. of oil; third year, 3,150 lbs. of flowers, 21 lbs. of oil; fourth year, 4,500 lbs. of flowers, 31.5 lbs. of oil. In the case of plants grown from seed the oil yield during the first few years is less than that obtained from plants grown from slips, though by the fifth year the yield is equal in each case.

The profits from lavender growing could be increased by planting evergreen oaks for truffle production in the waste land between lavender plantations. Far from interfering with one another, these two cultures would mutually benefit from the same cultivation and manures. It is well known that cultivation, by aerating the soil, favours truffle production, and this is increased in a marked manner by dressings with artificial, and especially with nitrogenous manures, as our experiments have already shown.*

The lavender plant is not, however, free from liability to disease. In many fields plants have been observed to die off, forming centres of infection. This is caused by a root fungus analogous to pourridié of the vine.† The only remedy is the eradication of diseased plants, which should be burnt. This disease has been more particularly noticed where lavender grows wild. Artificial plantations are almost immune, but as the fungus might be introduced with slips used for planting, it would be more prudent to establish new fields by means of seedlings. If, however, planting by slips is followed, the slips should be disinfected by dipping in a solution of sulpho-carbonate of potassium, strength 5 oz. to 10 gallons of water. Lavender is also liable to be attacked by dodder; strong vigorous plants are most liable, and soon succumb. Spraying with 15 per cent. sulphate of iron solution is the treatment recommended for this parasite.

Damage is also caused to the plants by cutting the flowering tops too long, thus diminishing the vitality of the plant. This, however, is easily

* *Revue de Viticulture*, xxxiii, p. 350, and xxxv, p. 204.
† Pourridé or root rot of the vine is caused by several fungi, the most important being *Dematophora necatrix* and *Armillaria mellea*.

avoided by carefully supervising the gathering; pickers have a tendency to cut the stems too low in order to increase the weight of the harvest.

In the Carpentras district lavender is chiefly found near Mount Ventoux. Over an area of about 10,000 acres, it is about equally disseminated on the flat land and on the rocky mountain slopes; lavender plantations are mostly confined to flat land, artificial *lavenderaies* occupy about one-sixth of the total land.

NOTES ON THE VAUCLUSE DISTRICT.

By F. de Castella, Government Viticulturist.

The foregoing article vividly recalls a brief visit to this most romantic region, in August, 1907, and how, as my host (Mons. A. Taccusel) and myself sat, after lunch, on the terrace overlooking the swift Sorgues river, sipping coffee and the *petit verre* of fifty-year-old cognac, an agreeable odour of lavender was distinctly noticeable in

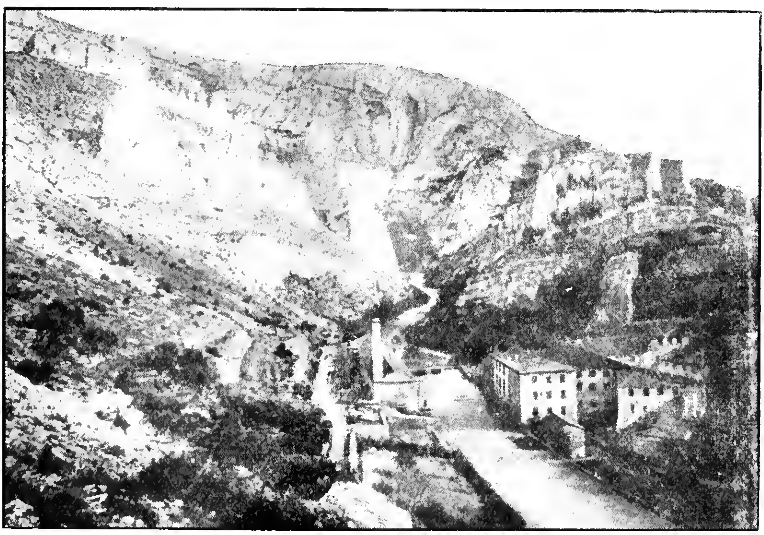


Fig. 1.—Vaucluse, France.—Portion of the Village (the rocky hills where the lavender grows are shown in the background).

the air. This, it was explained, came from a neighbouring distillery across the river, where the oil is extracted. Formerly lavender grew wild on the hills and other waste lands in the region, but of recent years it has been cultivated to some extent, where this is possible, with plough or scarifier. The wild plants are thus thinned in one direction; the loss of a certain number of them is, however, fully compensated by

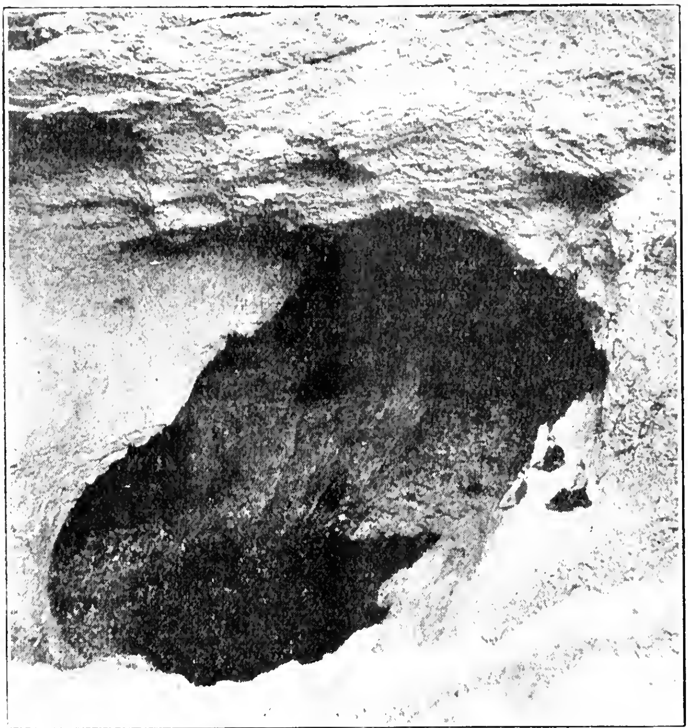


Fig. 2. Source of the Sorgues.—Cleft or vent whence the river issues.

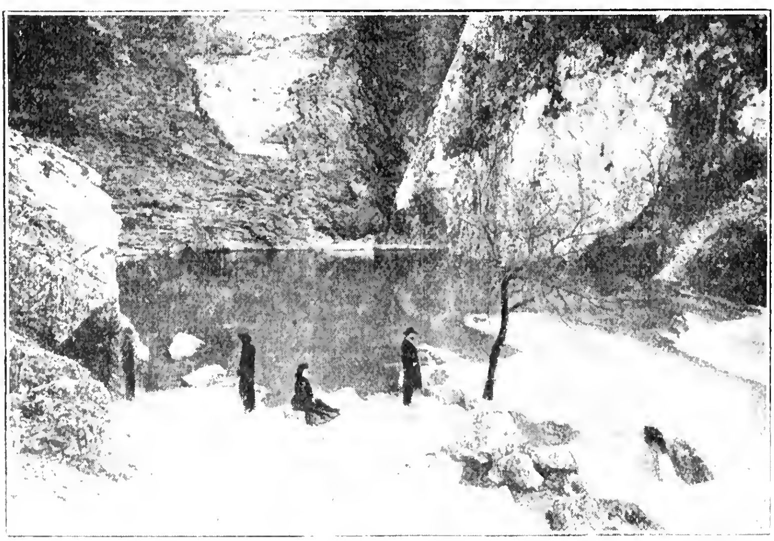


Fig. 3. Source of the Sorgues. (Photograph taken when the river was in full flow—at such times the vent shown in Fig. 2 is completely submerged.)

the stronger growth of those which remain. Light dressing with superphosphate also increase the yield and quality of the oil. Higher up the hills among the rocks (see Fig. 1) cultivation is no longer possible, and the herb grows wild. The price paid for the fresh flowers and stalks (cut at the top of the leaves) was at that time 24s. to 32s. per ton, delivered at the distillery.

Fig. 1 will give some idea of the rocky hillsides where lavender grows wild. Vaucluse, though little more than a village, has given its name to the department of which Avignon is the capital. It is usually known in the region as Fontaine de Vaucluse, owing to its being situated at the very source of the small River Sorgues, which, as is not unusual in this part of France, issues from a chasm, or vent, at the base of tertiary,

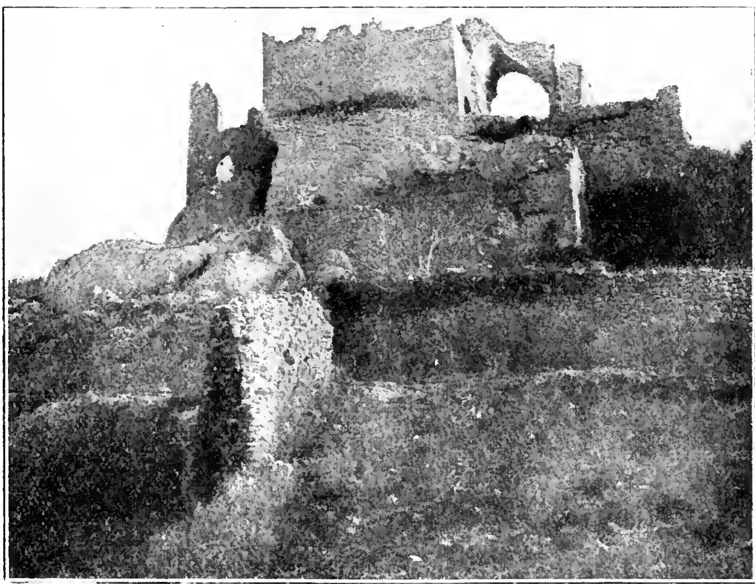


Fig. 4. Ruins near Vaucluse known as *Château de Petrarque*, also shown to the right in Fig. 1.

limestone, cliffs. Fig. 2 shows the chasm during a dry period, when the lessened flow finds its way to the river bed through crevices at a lower level; at seasons of greater flow, the water rises, completely submerging the chasm and overflowing into the main bed of the river, as shown in Fig. 2.

Vaucluse is celebrated in history for having been for some years the refuge of the celebrated Italian poet Petrarch (1304-74), or Petrarque, as he is known in French. After vainly striving to win the heart of the beautiful Laura de Noves, to whom he dedicated many celebrated odes and sonnets, he retired in despair to Vaucluse, where some of his finest work was written. The lady died of plague in 1348. At every turn the tourist is reminded of Petrarque and Laura; there is even a *Café*

de Petrarque in the village! I was informed by Mons. Taccusel, however, that the imposing ruins, which are a marked feature in the landscape (Fig. 4), and which are known locally as the Château de Petrarque, was never occupied by the poet; this castle was the ancient residence of the Bishops of Cavaillon.

Several interesting cultures, many of which are novel to an Australian, are in evidence in this region, where the fertile irrigated flats contrast strongly with the dry, almost barren, hillsides. Amongst others, silk and truffles may be briefly mentioned.

Concerning truffle culture, little is known to the average Australian. This is becoming quite a regular industry in Vaucluse. M. Taccusel informed me that he was replacing some of the vines in drier

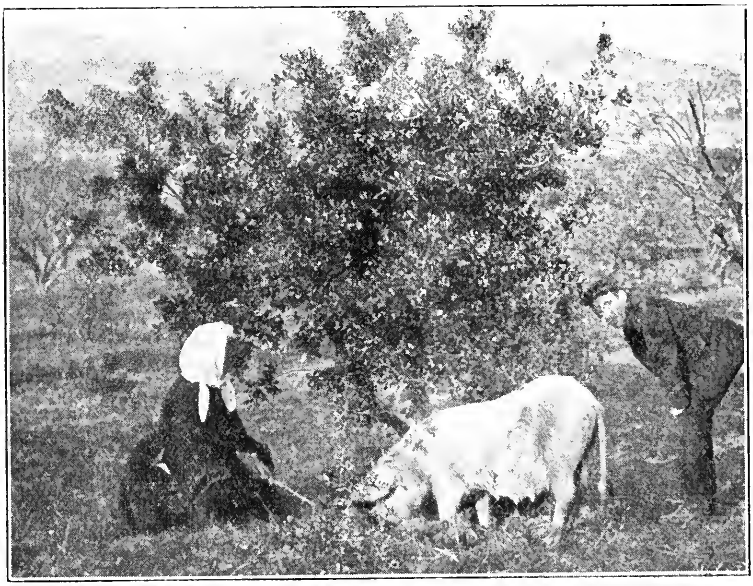


Fig. 5. Harvesting Truffles with the aid of a pig.

situations, where the yield was poor, by evergreen oaks. It is on the roots of this small tree that this highly valuable fungus lives as a parasite, forming the tubers, or truffles, which, at the time of my visit, were worth 13s. per lb., though in years of plenty the price falls to about one-third of this. Remarkable progress has been made recently in the establishment of artificial *truffieres,* in other words, evergreen oak plantations, with a view to truffle production. Small trees, 4 to 8 feet high, often bear a truffle on their roots of up to 1 lb. in weight. The harvesting of the crop is most interesting. Being underground, the tuber can only be located, thanks to the keen sense of smell of pigs or dogs; both animals are used for the purpose. Gathering, with the assistance of a pig, is shown in Fig. 5.

LUCERNE MANURIAL TRIALS AT RESEARCH FARM, WERRIBEE.

THE VALUE OF WINTER TOP-DRESSING AND RENOVATION.

(*H. A. Mullett, B.Ag.Sc.*)

Object of the Trials.

Lucerne is a plant which has wonderful foraging powers. When properly treated, yields from 6 to 8 tons of hay per annum may be obtained. It, however, makes large demands on the soil minerals, and, further, the watering which is usually necessary is not without its effect on fertility.

On most soils continual application of water results in the surface setting down. This leads to bad aeration and sour conditions, which, if not treated, will inevitably depress yields.

In extreme cases, such as may be seen in parts of the Goulburn Valley, so great is the need for manures that many of the stands are now quite unprofitable, while often the continual watering and lack of cultivation and drainage have caused such sour conditions, rushes have come up during the last two years on farms where they have never been seen before. It was with the object of determining the relative effect of manures in supplying mineral deficiencies and in augmenting and arresting the decline of yields, that a series of top-dressing trials was laid down at Werribee in 1913.

Thorough winter renovation was adopted as standard practice, and the success of both the manuring and the cultivation in maintaining yields and the freedom from rushes has been strikingly demonstrated. Similar results have been obtained in the northern irrigation districts.

Lay-out of the Plots.

The manures to be tested are top-dressed in parallel strips at right angles to the direction of the greatest slope of the land; even watering is therefore insured. The manurial application, which is top-dressed after the winter renovation in August, is made only every second year. Check plots, on which no manure is dressed are provided, and the dry-cured hay from each is weighed separately. Up to six cuttings are usually obtained per annum, but in some years, owing to failure of irrigation supplies and to other causes, fewer cuts have resulted. Last year four cuts were obtained, but, owing to shortage of labour, only three of the four were weighed, so that the figures for the yields of 1917-18 are for these three cuts only.

Results of Trials.

From the very first it was evident that certain of the manures, particularly superphosphate and stable manure, were having a marked effect on the yields. The effect of relatively insoluble manures like Thomas' phosphate and bone fertilizer has not been marked. The use of soil amendments like lime and ground limestone have given payable

returns, particularly last year, when, owing to excessive rainfall, somewhat sour conditions arose. The following are the results:—

Table showing Yield of Air-dry Commercial Hay obtained for the Seasons 1914-15, 1915-16, 1916-17, 1917-18.

No. of Plot.	Treatment.	1914–15.	1915–16.	1916–17.	1917–18.	Total.
		tns. cwt.	tns. cwt.	tns. cwt.	tns. cwt.	tns. cwt.
7	Super. 2 cwt.	5 11·0	4 1·6	4 18·3	3 0·8*	17 11·7
8	No Manure	4 12·7	3 4·8	3 11·9	2 9·1*	13 18·5
9	Ground Limestone 36 cwt.† ..	4 16·8	3 13·6	4 10·6	2 19·1*	16 0·1
10	Lime 20 cwt.† + Super. 2 cwt.	5 8·3	4 4·8	5 11·5	3 7·9*	18 12·5
11	Lime 20 cwt.† + Thos. Phos. 2 cwt.	5 4·2	4 5·6	4 10·6	3 4·4*	17 4·8
12	Lime 20 cwt.† + Bone Fertilizer 2 cwt.	5 7·8	4 1·6	4 8·4	2 16·7*	16 14·5
13	Lime 20 cwt.†	5 3·8	3 6·8	4 0·1	3 3·7*	15 14·4
14	Lime 20 cwt.† + Super. 2 cwt. + Sulp. Pot. 1 cwt. ..	5 2·8	5 5·6	4 14·9	3 4·6*	18 7·9
15	Lime 20 cwt.† + Super. 2 cwt. + Nitrate Soda 1 cwt. ..	5 19·1	4 13·6	5 3·2	3 10·4*	19 6·3
16	Lime 20 cwt.† + Stable Manure 10 tons	5 9·0	5 3·6	5 1·6	4 5·4*	19 19·6
17	Lime 40 cwt.† + Super. 2 cwt.	5 4·2	4 16·8	3 15·0	3 10·6*	17 6·6
18	Lime 20 cwt.† + Super. 2 cwt. + Blood Manure 1 cwt. ..	5 13·6	4 18·8	5 0·2	3 18·5*	19 11·1

* Note.—The weights given for 1917–18 are for 3 cuts only; 1 cut was not weighed.

† Note.—Lime was applied in 1913–14 (the initial year) and in 1914–15 only. The other manures were applied during these two years, and then every alternate year.

The table hereunder shows the net profit that has been obtained by the use of the fertilizer top-dressings. The manures were valued as under:—

	£	s.	d.	
Superphosphate	5	0	0	a ton
Blood manure	11	0	0	„
Bone fertilizer	6	5	0	„
Ground lime	1	10	0	„
Ground limestone	0	17	6	„
Stable manure	0	2	6	„

It will be noted that all dressings have given payable returns, and that the least profitable plots have been those treated with insoluble manures. While stable manure has given the highest net profit per acre, it is not always readily obtainable. Superphosphate has given the greatest return for the outlay involved. It has been shown to be an even more valuable stimulant for lucerne than it is for wheat. For an outlay of 1 cwt. of superphosphate per annum, valued at 5s., an average net profit of over £2 per acre has been obtained as a result of top-dressing.

TABLE SHOWING AGGREGATE NET PROFIT PER ACRE FOR FOUR YEARS, OBTAINED AFTER DEDUCTING THE COST OF THE MANURE.

No. of Plot.	Treatment per Acre.	Total Weight of Hay for Four Seasons.	Increase over No Manure Plot.	Value of the Increase at £2 10s. a Ton.	Total Cost of the Manure applied per Acre.†	Aggregate Net Profit per Acre for Four Years, after deducting Cost of Manure.
		tns. cwt.	tns. cwt.	£ s. d.	£ s. d.	£ s. d.
16	Lime 20 cwt. + Stable Manure 10 tons ..	19 19·6	6 1·1	15 2 9	4 0 0	11 2 9
18	Lime 20 cwt. + Super. 2 cwt. + Blood 1 cwt. ..	19 11·1	5 13·6	14 4 0	3 12 0	10 12 0
15	Lime 20 cwt. + Super. 2 cwt. + Nitrate Soda 1 cwt.	19 6·3	5 7·8	13 9 6	*	
10	Lime 20 cwt. + Super. 2 cwt.	18 12·5	4 14·0	11 15 0	2 10 0	8 5 0
7	Super. 2 cwt.	17 11·7	3 13·2	9 3 0	1 0 0	8 3 0
14	Lime 20 cwt. + Super. 2 cwt. + Sulp. Potash 1 cwt.	18 7·9	4 9·4	11 3 6	*	
11	Lime 20 cwt. + Thos. Phos., 1 cwt.	17 4·8	3 6·3	8 5 9	*	
17	Lime 40 cwt. + Super. 2 cwt.	17 6·6	3 8·1	8 10 3	4 0 0	4 10 3
12	Lime 20 cwt. + Bone Fert., 2 cwt.	16 14·5	2 16·1	7 0 3	2 15 0	4 5 3
9	Ground Limestone 36 cwt.	16 0·1	2 1·6	5 4 0	1 11 6	3 12 6
13	Lime 20 cwt.	15 14·4	1 16·9	4 12 3	1 10 0	3 2 3
8	No Manure	13 18·5	..	..	..	Nil

* As nitrate of soda, basic slag, and sulphate of potash were obtainable at prohibitive prices only, calculations of net profit from their use have not been made.

† In calculating the profit per acre the cost of the manure for two seasons only and the return of hay for four seasons have been taken into consideration. As a matter of fact the cost of an application of manure which was made at the seeding in 1913 and for which no direct returns were obtained has not been included. This dressing would have a certain residual effect, which must be taken into account, but off-setting this there would be the after effects of the whole of the applications. The value of which can only be surmised. It is probably quite as much as that of the first application spread over five years.

Winter Renovation.

There can be no doubt that the winter renovation has contributed largely to the results, and recent observations in the Goulburn Valley irrigation areas have shown that where no cultivation is undertaken or manure applied, the stands have become very ragged. The most advanced men, however, by manuring and cultivation have, except in extreme cases, kept their plots in good order and eradicated weeds and rushes, and their stands of lucerne leave nothing to be desired.

It should be remembered that the lucerne in the irrigation areas is now four years older than it was at the time of the last drought, and should abnormally dry conditions recur, the stands will not be nearly so remunerative either for grazing or for hay growing.

In nearly every case the increased yield of lucerne will pay for a thorough scarifying in two directions at right angles, and then a dressing of 1 cwt. of superphosphate. The present month is the best time for such treatment.

TREATMENT OF CREAM.

By J. J. Ricketts, Dairy Supervisor.

The quality of butter depends on the class of cream from which it is made. No farmer ever considers his cream inferior to that of his neighbour, and very often the remark is made, "I got only 35 per cent. and my neighbour got 45 or 50 per cent. butter." This difference may usually be traced to the running of the home separator. In a new separator the cream screw is adjusted so that, if the regulated revolutions per minute are maintained, a cream containing between 45 and 50 per cent. of butter will be obtained. Not once, but scores of times, I have witnessed a separator in action, and on inquiry been told that the handle was making forty-five revolutions per minute, yet on timing them with a watch, have found that the number was only forty, and sometimes it has been as low as thirty-seven. The operator of a separator should always have a watch hanging in front of him, so as to be able to check the speed of the separator. Some machines are geared to forty-five and some sixty revolutions per minute, and, if satisfactory results are to follow, the correct speed should always be maintained. Too often the farmer says, "I received 45 per cent. last week and only 38 per cent. this week," and, without trying to find out the reason, blames the factory manager. If the separator is geared to forty-five revolutions per minute, and only forty are turned, it means that the driving wheel makes five hundred less revolutions of the bowl. The farmer, in consequence, gets a much larger yield of cream, but of a poorer quality in fat.

The float in the separator regulates the supply of milk from the receiving vat. If the stem on the float has been broken off and resoldered the additional weight may be sufficient to sink the float down in the top cover and allow a larger supply of milk into the machine than it can deal with, so that a proportion is going through the separator and leaving it only partly skimmed. At a dairy farm recently I looked into the skim-milk tank, and noticed that the contents had a thick coating of cream on it from the morning's separating. Another cause of the variation in the results is that occasionally the cream screw may work loose and almost fall out. Within the last few months I met with a case of this kind, but it is not common. Where a large quantity of milk is dealt with by means of a hand separator, the cream at first is of a good consistency, but as the operator tires the turning becomes slower, and though the return of cream increases in volume, there is a corresponding falling off in quality. The worth of cows on a dairy farm are too often gauged by the number of cans of cream—not by the quantity of butter which the cream will produce.

Another very common complaint of the farmer is the classification of his cream as second grade. There are many factors which affect the quality of cream, such as insanitary cow sheds, badly ventilated dairies, keeping small quantities of cream too long, water supply, fodder, &c.

Water for cows should, if possible, be provided from a trough supplied by a windmill and ball tap. This insures the trough always being full. Water coming from black puggy soil often carries an organism which

causes ropy milk and cream. Such places should be fenced off, so as to prevent the access of dairy cows.

A cowshed should have fairly high walls—at least 8 feet—and it should be seen to that there is plenty of light and ventilation. The floor should be impervious to moisture, and have a fall from the front to the back of the cow, and a brick or concrete drain. The skins of sheep, rabbits, foxes, or any other animals, should not be taken into a cowshed to dry. They attract flies and exude a most offensive odour, which quickly taints milk and cream.

The dairy should not be used as a storeroom—it should contain nothing but the separator and cream. The building should be of a fair height, large enough for the convenient handling of the milk, and plenty of light and ventilation is, of course, essential.

Fodder for cows should be of the best quality. Too often is it said, "This chaff is not good enough for the horses; give it to the cows." The quality of the cream depends on the quality of the feed given to the cows. Keeping cream too long is one of the many oversights found on small holdings where from one to three cows are milked. A can is placed under the separator on Monday morning, and it remains there perhaps until Friday or until it is full. The cream from each separating goes into the one can—the hot cream twice a day running in on top of the cold cream, and sometimes it is the practice not to wash the separator at night. When a can of such sort of cream is delivered at the factory it is fermenting, and "boiling" over the top of the can, and then is heard the cry, "I got only second quality to-day."

The separator should be washed as soon after use as possible, and the various parts scalded by being put into a trough or tub and a can of boiling water poured over them. They should then be placed in the sun to dry.

A separate vessel should be used to catch the yield of each separation and the morning's cream should not be added to the general can until evening and the evening's cream until the following morning. I have for years noted that when this method of handling cream is followed there is usually no complaint about second quality. The stirring of the cream twice a day at least is a good preventive against the growth of bacteria, and makes the cream of a more uniform quality.

Recently I made inquiries regarding the quality of butter produced on a farm where only a few cows were milked, and where the precautions suggested above were observed, and the cream churned twice a week. I was told that the butter was considered the best made in the district, and was much sought after by the residents. This proves the advisability of making butter while the cream is reasonably fresh. or if the cream be sold to a factory, the desirableness of sending it as frequently as possible.

The pasturing of dairy cows on rape or any rank greenstuff immediately prior to milking also has a marked detrimental effect on the quality of cream. While the food is undergoing the process of digestion some of its gases pass into the blood, and as the milk is secreted from the blood, some of them are given off with the milk. If the cows are pastured on the fodder immediately after milking and taken off

several hours before milking, the gases will have in the meantime been consumed by the digestive system.

Unclean cans also have a detrimental effect on the quality of cream stored in them, and those in a rusty condition should not be used. Rust slightly "honey-combs" the iron, and the crevices thus formed make good breeding-places for different kinds of bacteria. If cream be kept for a few hours in a rusty can with the lid on, it will give off a strong unsavoury smell, and this is often the cause of second quality cream. Sometimes when a can is patched the hole is not first soldered, and consequently there are small cavities, which cannot be thoroughly cleansed, with the result that cream put into the can is contaminated. When cans are returned from the factory, they should always be washed, steamed, or put in boiling water before being again used, and it should not be overlooked that the outside of the cans requires as much attention as the inside, for the same hands handle both cans and cream.

Cream is often carted to the roadside and left standing there perhaps hours for the cream cart to come along. When treated thus in the hot days of summer, and afforded no protection from the sun, is it any wonder that it is marked second quality. A farmer knows that if he kills a sheep at night he must be up in the morning and bring the carcass in before the warm sun gets on it, but he does not think of the sensitiveness of cream to the heat. It would not take long to provide a small shed for the cream to stand in while it remains at the roadside waiting for the carrier. Many a can of good cream has been ruined by permitting it to stand in the sun, and farmers have admitted to me that the only time they have had second quality cream was when they neglected it thus.

From the observations made, it is plain that the farmer possesses the power to regulate his cream returns and to improve the quality of his cream. If he would but exercise this power, he would have less abuse for the butter factory manager, for no butter maker can manufacture first class butter out of second quality cream.

The aim of the Dairy Supervision Act is to improve the quality of our dairy produce. If, in order to comply with the provisions of the Act, the farmer has to build better sheds and dairies, he should not forget that these tasks will bring him larger profits and will also increase the value of his holding.

NOTES ON THE SAPINDUS OR SOAP TREE.

According to Dr. Trabut (*Revue de Viticulture,* 5th January, 1901), a species was imported by the Algerian Government in 1845. Young plants were raised and distributed to settlers in 1859. In 1867, Hardy, Director of the Alger Experimental Gardens, drew attention to its heavy crop of fruit. In 1869, Riviere, Hardy's successor, catalogued it as follows:—

> "*Sapindus emarginatus.*—Tree of Central American origin, producing fruits, the envelope of which can replace soap for washing linen."

This Sapindus is allied to a Japanese species, *S. mukorossi,** from which it differs by its keeled fruit, a new species was therefore created, viz., *S. utilis.* The fruit, when dry, weighs up to 6 or 7 grammes ($\frac{1}{4}$ oz.). Seedlings vary greatly, especially as regards yield. M. Bertrand planted cuttings of selected seedlings in 1895; by 1901, some trees yielded up to 50 kil. of fruit each (110 lbs.), whereas seedlings seven years' old bore no crop. Dr. Trabut considers the tree to be worthy of taking an important place in French-Colonial cultures.

Riviere and Lecq, in their work *Practical Agriculture for Northern Africa,* devote a couple of pages to this tree under the title of Sapindus or Soap Tree. Trees belonging to the Sapindaceæ family bear fruit with a soapy pulp which has been used for centuries by different peoples of tropical countries. It is a handsome, almost evergreen, tree, often bearing heavy crops of fruit varying in size from that of a large filbert to a walnut. The plant referred to by Dr. Trabut was sent to Alger from the Botanical Gardens of the Paris Faculty of Medicine, under the name of *S. marginatus.* It is sometimes also called *S. emarginatus.* It was renamed by Radlkofer in 1873 *S. mukorossi var. Carinatus.* During the past few years (the work is dated 1914), a *Sapindus utilis* has been much spoken of, which is none other than the old plant re-baptized. This large tree has a well-defined trunk, and handsome, almost evergreen, leaves. The fruit ripens in winter. It thrives on the lower plains in rich, free, irrigable soil, which alone suits it; under other conditions, its growth is slow, and yield poor.

On boiling the fruit with water, a soapy emulsion is obtained well-suited for cleaning woollens and silk, to which it gives a kind of lustre. The dried fruit contains about 62 per cent. of sapindine (probably the same as saponine). A fine white powder can be extracted from it, which was much remarked at the Colonial Exhibition at Lyon, in 1894. A considerable demand for this was booked for in connexion with the wool and silk spinning industries.

The authors consider that it would be imprudent to conclude that this fruit has an economic value and an assured demand such as would render its plantation on a large scale profitable. Attempts to popularize the product during the past twenty years have led to no result. Two or three Sapindus trees on a farm would suffice for household needs.

More recently still (*Progres Agricole* 1911-1912), Gastine has recommended Saponine for the purpose of giving greater wetting power to fungicide sprays, for which purpose it seems to be of considerable value. This use is also referred to in the reports of the Woburn Experimental Orchard (Pickering and the Duke of Bedford). Gelatine and casein are now used for the same purpose.

In the Melbourne Botanical Gardens, there are three species of Sapindus, viz., *S. emarginatus,* about 3 feet high; *S. mukorossi,* about 10 feet high; and *S. trifoliatus,* a small plant.

* In Japan this is known botanically as Sapindus Mukuroshi, the specific name being derived from Mukuroji, the common Japanese name of the tree.

VICTORIAN RAINFALL.

Second Quarter, Year 1918.

District.	—	April.	May.	June.	Quarter.
		Points.	Points.	Points.	Points.
Mallee North	District Mean	128	328	101	557
	Normal	61	116	139	316
	Per cent. above normal	110	183	..	76
	„ below „	..	..	27	..
Mallee South	District Mean	106	302	124	532
	Normal	91	132	172	395
	Per cent. above normal	16	129	..	35
	„ below „	..	..	28	..
North Wimmera ..	District Mean	145	266	223	634
	Normal	111	164	208	483
	Per cent. above normal	31	62	7	31
	„ below „	..	..	..	..
South Wimmera ..	District Mean	206	313	280	799
	Normal	152	197	270	619
	Per cent. above normal	36	59	4	29
	„ below „	..	..	..	..
Lower Northern Country	District Mean	142	442	186	770
	Normal	109	171	220	500
	Per cent. above normal	30	158	..	54
	„ below „	..	..	15	..
Upper Northern Country	District Mean	184	466	229	879
	Normal	145	193	264	602
	Per cent. above normal	27	141	..	46
	„ below „	..	..	13	..
Lower North-East ..	District Mean	216	688	363	1,267
	Normal	170	257	388	815
	Per cent. above normal	27	168	..	55
	„ below „	..	..	6	..
Upper North-East ..	District Mean	309	1,146	636	2,091
	Normal	266	373	597	1,236
	Per cent. above normal	16	207	7	69
	„ below „	..	..	..	..
East Gippsland ..	District Mean	178	156	384	718
	Normal	240	246	308	794
	Per cent. above normal	..	..	25	..
	„ below „	26	37	..	10
West Gippsland ..	District Mean	158	619	366	1,143
	Normal	288	303	349	940
	Per cent. above normal	..	104	5	22
	„ below „	45	..	..	..
East Central	District Mean	141	575	267	983
	Normal	274	306	341	921
	Per cent above normal	..	88	..	7
	„ below „	49	..	22	..

VICTORIAN RAINFALL—*continued.*

District.	—	April.	May.	June.	Quarter.
		Points.	Points.	Points.	Points.
West Central	District Mean.. ..	123	311	222	656
	Normal	192	214	244	650
	Per cent. above normal	..	45	..	1
	„ below „	36	..	9	..
North Central ..	District Mean.. ..	260	590	353	1,203
	Normal	185	253	334	772
	Per cent. above normal	41	133	6	56
	„ below „	..	..	..	..
Volcanic Plains ..	District Mean ..	141	354	268	763
	Normal	183	224	264	671
	Per cent. above normal	..	58	2	14
	„ below „	23	..	..	..
West Coast	District Mean.. ..	126	413	367	906
	Normal	241	302	352	895
	Per cent. above normal	..	37	4	1
	„ below „	48	..	..	..

N.B.—100 points = 1 inch.

THE CASTOR-OIL PLANT AND ITS CULTIVATION.

Possibility of Establishing the Industry in Australia.

1. *Introduction.*—Castor-oil is derived from the seed of the Castor Plant, *Ricinus communis, L.,* which is believed to be a native of North Africa and India. Of this plant, there are numerous varieties which are sometimes regarded as distinct species.

The Castor Plant is cultivated as a crop in India, Java, Brazil, and the United States, and is grown as an ornamental garden shrub in most of the warmer countries in the world. It is also found as a wild or semi-wild plant in most warm countries, having probably escaped from cultivation.

In the tropics, it forms a small tree from 20 to 30 feet or more in height. In warm-temperate climates, it is a shrub 8 to 12 feet high, whilst in localities where frost occurs it is a herbaceous perennial. Under cultivation in temperate climates it is treated as an annual.

In India, the leaves are used as fodder for cattle, and in Assam they are used for feeding the Eri silkworm. The chief product of the plant is, however, the seed or Castor-bean, from which oil is extracted.

The beans produced by different varieties vary in size, colour, and shape, as well as in oil content. For practical purposes, the varieties may be grouped as large and small-seeded forms. The former are more prolific in yield, and the oil obtained from them is used chiefly for lubricating and industrial purposes, the small-seeded varieties yield the better-quality oil used in medicine.

2. *Cultivation.*—Since the castor plant is sensitive to frost, it requires a warm climate, or a temperate climate with a long summer. In general, it will succeed in any locality where maize will ripen. Moisture is essential for the germination of the seed, but when once the plant is established, it requires little rain, and excessive rainfall is injurious to it. The most suitable soils are rich, well-drained, sandy, or clayey loams, or in general soils which will produce good wheat or maize crops. Very loose sand and heavy clays are alike unsuitable.

Deep ploughing and harrowing are essential. The plant is exhausting to the soil, and, except in virgin land, requires manuring. For this purpose, the residual cake left after expressing the oil is valuable, and the leaves and seed husks of the plants are also useful if ploughed in. Pure crops should not be taken from the same land more than once in five or six years. In India, it is not often grown as a pure crop, but is usually grown as a hedge round cotton or sugar fields. The plants are not liable to the attacks of fungi or insects to any great extent.

3. *Harvesting.*—The capsules of the small-seeded varieties begin to ripen in four or five months, those of the large-seeded varieties in seven to ten months after sowing. Since when ripe the capsules of many varieties burst suddenly and scatter the seed to a considerable distance, it is necessary to gather the spikes bearing the capsules as soon as they show signs of ripening. When ripening has commenced, the crop requires looking over once a week in order that ripening capsules may be gathered. An attempt has been made in the United States to produce a variety which ripens all its capsules at once, but apparently this has not been accomplished.

The capsules when gathered are spread out on a floor, preferably in an open shed where they are exposed to the sun and protected from the rain. They need to be turned over from time to time. When all the capsules have shed their seed, the husks are removed and the seeds swept up and collected. Capsules are also gathered from wild plants, and the seed obtained in the same manner.

India is the principal producing country, exporting annually about 1,500,000 cwts. of beans. In addition, about 1,500,000 gallons of oil are exported annually from seed crushed in India. Before the war, about 400,000 gallons of this oil were exported to Australia.

4. *Extraction of the Oil.*—Castor beans are crushed by crude native machinery in India as well as by more modern machinery. Beans imported to Europe are crushed chiefly at Hull and Marseilles by methods similar to those adopted for other oil seeds. The only firm in Australia which manufactures the oil from imported seed is Lycett Proprietary Limited, Normanby-road, Montague, Melbourne.

For the finer grades of oil, selected seed is taken, the husk removed, and the soft kernels expressed in the cold. The colourless oil thus obtained is free from the poisonous principle, ricin, which is present in the seeds. The remaining cake is pressed again, yielding inferior oil.

Inferior seed is hot-pressed directly, or else the oil is extracted by solvents. The solvents used are carbon bisulphide, or alcohol. The oil is subsequently refined by steaming.

The beans contain 45 to 53 per cent. of oil, about 40 per cent. being obtained by expression. The residual cake is not available for stock feeding, since it contains the poisonous ricin. It is, however, as already mentioned, a useful manure.

5. *The Castor Plant is Australia.*—The castor plant grows wild in many parts of Australia, particularly in Western Australia; along the Torrens River, in South Australia; and in the neighbourhood of Sydney. Mr. W. M. Doherty, F.I.C., stated in a communication to the Industrial Section of the Royal Society of New South Wales, in April, 1918, that he had collected seeds from a vigorous plant growing in sand near the shore of Botany Bay, and he exhibited samples of oil crushed from the seed of two varieties grown at Wamberal, near Gosford, New South Wales. The analysis of the oil was quite satisfactory.

Lycett Proprietary Limited have tested two samples of seed from Western Australia on a laboratory scale, and obtained 47 and 49 per cent. of oil respectively, as against 53 per cent. from Calcutta and Java beans. This is high enough to form a paying proposition provided the seed could be obtained in sufficient quantities.

6. *Prospects of the Industry.*—Castor oil is used largely as a lubricant for machinery, especially in warm climates, and its use has been increased lately in Europe and the United States, owing to the demand for it as a lubricant for aeroplane engines. The present price of the seed in Australia is £20 to £25 per ton, c.i.f., Melbourne, and the demand is about 200 tons per month. Before the war, the price was £11 to £13 per ton, but it is very improbable that prices will fall as low as this for a number of years after the war.

The crop, as already indicated, is a quick-growing one, and seed can be harvested within six to ten months. The chief drawback is undoubtedly the labour required in gathering the seed. In addition, there is no experience available in Australia as to the best cultural methods, nor as to the best varieties of seed for cultivation. Lycett Proprietary Limited are planting a small area at Violet Town, Victoria, in order to obtain this information for the benefit of growers. In the meantime, this firm is prepared to supply Indian seed to intending cultivators.

—(*Communicated by the Commonwealth Council of Science and Industry.*)

ORCHARD AND GARDEN NOTES.

(*E. E. Pescott, F.L.S., Pomologist.*)

The Orchard.

If the winter spraying has been delayed, it should be completed as quickly as possible, and before the buds begin to swell and burst.

It is not advisable to spray the stone fruits with the red oil emulsion at this time, as there is danger of burning and destroying the early buds that may be swelling, and consequently loosen their outside scales. It will be safe, if the work be done at once, to spray apple, pear and quince trees with this spray, especially where the Byrobia Mite, scale insects, or woolly aphis are prevalent.

If it is intended that the lime-sulphur wash be the specific for these and other pests, it may be used with safety, although the spraying should be completed as early as possible. This mixture has a certain value as a fungicide, and it is well worth trying on peach trees that have been affected with the leaf curl; more especially in view of the fact that in some districts severe burning has occurred in peach orchards as a result of using Bordeaux mixture late in the season.

Where peach aphis has appeared, it will be advisable to spray at once with a strong nicotine solution. Tobacco stems should be soaked in cold water for some days, and a teaspoonful of caustic soda added to a cask of steeping stems. The liquid should be made strong, and every endeavour made to kill out the first insects that appear.

The pruning of deciduous trees should be at an end this month. The pruning of evergreens such as oranges, lemons, and guavas, may be left until later.

Young deciduous trees must be planted not later than this month. The soil should be trodden firm round the roots, and, when planting has been completed, the tree ought to be headed back to three or four buds on each arm.

Preparation may be made for planting citrus and other evergreen trees. It is necessary that the soil be well ploughed and sweetened in anticipation of planting in September and October.

In root-borer affected districts, the beetles will begin to appear during the latter part of the month. A close observance should be kept on them and the insects regularly collected and destroyed.

The Flower Garden.

All winter-flowering shrubs that have dropped their blossoms may now be pruned. It is important to prune these immediately after flowering, so that the plant may be able to make plenty of flowering wood for next season.

Seed beds and plots need constant cleaning and weeding. Weeds must now be kept out of the garden, both by hoeing and hand picking. The seedlings growing in their permanent situations should be thinned out and given a good chance to develop strong and sturdy plants.

Divisions of herbaceous plants such as delphiniums, cannas, shasta daisy, herbaceous chrysanthemums, rudbeckias, salvias, and phlox, may still be planted out. If it is intended to leave the plants in the places they occupied last season, they should be lifted, the soil being well dug and manured, and the crowns planted back again. By this means the plants retain their vigour, and are able to produce good flowers each season.

Evergeen shrubs may now be planted out, if the spots chosen for them have been well dug and aired. All beds should be well dug over by this time, manure and refuse litter having been dug into the soil.

A few corms and tubers of early summer flowering bulbous plants may now be planted.

The Vegetable Garden.

The plots should be well dug over at this time, adding gypsum or lime where any pests have been prevalent. In other beds stable manure should be well worked into the soil.

The soil should be rich, well worked, and warm, so that a quick growth may result. Vegetables quickly raised are generally more tender than slowly grown ones; and frequent changes of crops in the plots will give better results. At this season, the weeds will require constant checking; frequent use of the hoe will, therefore, be necessary, and in the rows hand-weeding should be resorted to.

All seedlings should be planted out, especially seedlings of cabbage, cauliflower, lettuce, and onion. Seeds of peas, carrots, parsnips, radish, lettuce, tomato, and broad beans may be sown.

Where they can be sheltered and protected from frosts, young tomato plants may be planted out for early fruiting. One method of managing these early plants is to place the young plant a few inches below the surface, and then a box, 8 or 9 inches deep, with top and bottom removed, over the plant at ground level. This can then be covered loosely with a piece of glass whenever necessary.

Potatoes, artichokes, and asparagus crowns may be planted. Asparagus beds should be kept free from weeds; they should have a loose surface, and a light top dressing with old manure would be beneficial.

In the frames, cucumber, vegetable marrow, melon, pumpkin, water and rock melon seeds may be planted. These are best planted in pots placing three or four seeds in each pot; they then suffer no check when being transplanted into beds.

REMINDERS FOR SEPTEMBER.

LIVE STOCK.

Horses.—Feed stabled horses well; give green stuff if available. Continue rugging to encourage the shedding of the coat; good grooming will also be beneficial. Give hay or straw to grass-fed working horses. Feed old and badly-conditioned horses liberally. In foal mares due to foal early, if worked, should be turned out to paddock. Stallions doing stud duty should be fed liberally. Equivalent amount of cracked Indian corn (maize) may with advantage be substituted for oats, if latter grain is scarce.

Cattle.—Cows should still be rugged, but coverings should be removed frequently, in order to enable the animal to get rid of the old coat; or, better still, a good curry-combing may be given. Continue hay or straw. Look up treatment for milk fever in *Year-Book of Agriculture,* 1905, and treat cattle accordingly. Give calves a good warm dry shed. Give the milk to young calves at blood heat. Have feeding troughs or buckets clean. Don't over-feed. Feed regularly with regard to quantity and time. Provide a good grass run, or fine hay or crushed oats in a box or trough. Give a cupful of limewater per calf per day in the milk. The problem with many at the present time is how to rear calves without milk. This can be done very well by starting them on new milk for a fortnight, and then gradually substituting the milk with one of the calf meals on the market. To these it would be advisable to add two or three tablespoonfuls of cod liver oil. The following meal is in general use in Ireland:—Two parts, by weight, of oatmeal, 2 parts maize meal, 1 part pure ground linseed, all finely ground. Scald with boiling water, and allow to stand for twelve hours. Start with new milk, then gradually substitute skim and ¼ lb. daily of the meal mixture per head per day, gradually increasing to 1 lb. or more. In a month milk may be dispensed with altogether. The crushed oats, fed dry, have been found to give excellent results.

Pigs.—Supply plenty of bedding in warm well-ventilated sties. Keep sties clean and dry, and feeding troughs clean and wholesome. Sows may now be turned into grass run. If pigs are lousy dress with kerosene emulsion or sulphur and lard, rubbing well into crevices of skin, and disinfect sties. Considering the present high price of pork, there should be a good margin of profit in fattening pigs. Worms are very prevalent at present, and may be treated by giving 2 to 10 grains of Santonin in form of pill, or from half to one teaspoonful of oil of turpentine in milk or castor oil.

Sheep.—Wherever early shearing is possible, and shelter available, all sheep to be disposed of can be fattened earlier, if shorn. Sheep or lambs not good enough for freezing also thrive better after being shorn. Where insufficient knowledge of grading cross-bred wool exists, draft the coarse sheep from the fine before coming into the shed, and shear and bale separately. Clean all daggy sheep before bringing them on to the shearing board. Avoid deep and careless skirting. Only dense seedy parts, and heavy fribs and stains should come off fleeces. Press in a box press, which forms square sides to bales, and avoid round bales, called "Sew Downs." Pack in all possible. Brand boldly and neatly on the long and narrow side. Clean carefully all straw, chaff, &c., from shearing place. Cut back all misshapen feet when noticed during shearing. Mark all "duggy udder" ewes for disposal, and all black-marked and inferior-fleeced sheep.

Yard and go through all well-bred Merino-Lincoln cross lambs before offering to exporters. Select, ear mark, and shear all best sorts for future breeding and shearing. Buyers will find shafty, well bred, fine to medium grade wools, disappointingly scarce for years.

Poultry.—September is one of the best months for hatching for winter eggs. Incubators should be kept going, and broody hens set. Care must be taken to keep down vermin, as they now breed quickly; use sprays in houses and Insectibane or Izal in nests—nothing stunts chickens quicker than vermin. The food

for young chicks should be fine oatmeal, stale bread crumbs or biscuit meal, a little calcined bird's grit, a little chopped green stuff such as lettuce, thistles, or green lucerne or spring onions occasionally cut fine is a good tonic, and a pinch of powdered charcoal. Slightly moisten with new milk. Make the whole friable, and feed frequently ("little and often") just as much as they will readily eat, as an excess of food only sours and disturbs their digestive organs. Animal food may be given in small quantities after the first ten days once or twice a week. Chickens should be protected from damp ground and the cold, bleak winds.

CULTIVATION.

Farm.—Plant early potatoes, and work up fallow for the main crop. Keep fallow for summer forage crops well worked up with the disc and harrows. Make early sowings of mangolds, beet, field carrots, and turnips. Push on with the fallowing in the Northern Districts. Prepare land for tobacco seed beds by burning rubbish on the site; afterwards work up to depth of three or four inches.

Orchard.—Commence spring ploughing; plough in leguminous crops for green manure as soon as the plants are in full flower. Finish grafting early in the month. Spray peach and apricot trees with Bordeaux mixture as the blossom buds are opening, as a preventive against "leaf curl" and "shot hole" fungi; watch for peach aphis, and spray when present with tobacco solution.

Flower Garden.—Cultivate and work up the surface to a fine tilth—clear out all weeds. Water newly-planted shrubs, &c., if the weather is dry. Plant out cannas, early dahlias, chrysanthemums, gladioli, and other herbaceous plants.

Vegetable Garden.—Plant out seedlings. Sow seeds for summer use, such as tomatoes, cucumbers, marrows, pumpkins, melons, &c. Plant out tomatoes, and shelter till frosts are over. Hoe and work up the soil surface.

Vineyard.—Plantation of young vines (grafted or ungrafted) should be concluded before the commencement of September; pruning of old vines likewise, as well as tying down of rods on long-pruned vines. Prune recently-planted vines just before buds commence to swell (if not pruned when planted), cutting strongest cane back to two buds. Do not delay this work until buds have shot, as this seriously weakens the young vine. Field grafting may be carried out, if weather be fine and warm. If cold and wet, postpone until October. Swab with acid iron sulphate vines which showed signs of Black Spot last season. To avoid burning, this must be completed before the buds commence to swell. (See articles in issues of July, 1917 and 1918.) Cultivation (scarifying or discing) must receive attention when soil is in suitable condition.

Cellar.—Conclude spring racking early in month, if not already done. Fill up, regularly, all unfortified wines.

GOOD FITTING COLLARS ESSENTIAL.

With the great demand for horse-power on the farm and in the army, we are looking after the welfare of our horses somewhat more carefully. Protecting them from pain while at work or at rest is about on a par with good food and shelter in aiding these faithful animals to generate their maximum amount of power.

Sore shoulders and neck are common sources of pain to the working horse. Since these important parts are under such severe pressure while pulling a load, it is very necessary to keep them sound. It has been found that practically all injuries to these regions can be avoided if proper care is exercised. Poorly-fitting collars and neglect to the parts themselves are potent causes of shoulder and neck troubles.

It is well to remember the old maxim, "fit the collar to the horse and not the horse to the collar." The necks and shoulders of horses (writes J. W. Benner, in the *Maritime Farmer*) are found to differ about as much in shape as those of people, so a collar fitting one horse is oftentimes a misfit for another.

Best results are obtained where the collar follows closely the contour of the shoulders and fits in closely to the sides of the neck. Collars that are too wide, which stand away from the sides of the neck too far, cause harmful friction upon the working surface of the shoulders, often resulting in the formation of abscesses, ulcers, and shoulder sweeney.

The care of these important regions of the horse's body is simple enough if the proper collar is chosen for the animal. In hot summer weather it is good practice to wash the shoulders and necks of horses every evening when the collar is removed. It should never be done just before the animal is to be worked, for the skin should always be dry when the collar is to work upon it.

Common soap of non-irritating qualities may be used for bathing these parts, or a choice of two or three other preparations may be made. Cold salt water, water with a little vinegar added, or about one per cent. alum water may be substituted for the soap and water, and seem to be somewhat more toughening to the skin than the latter.

—*The Queenslander.*

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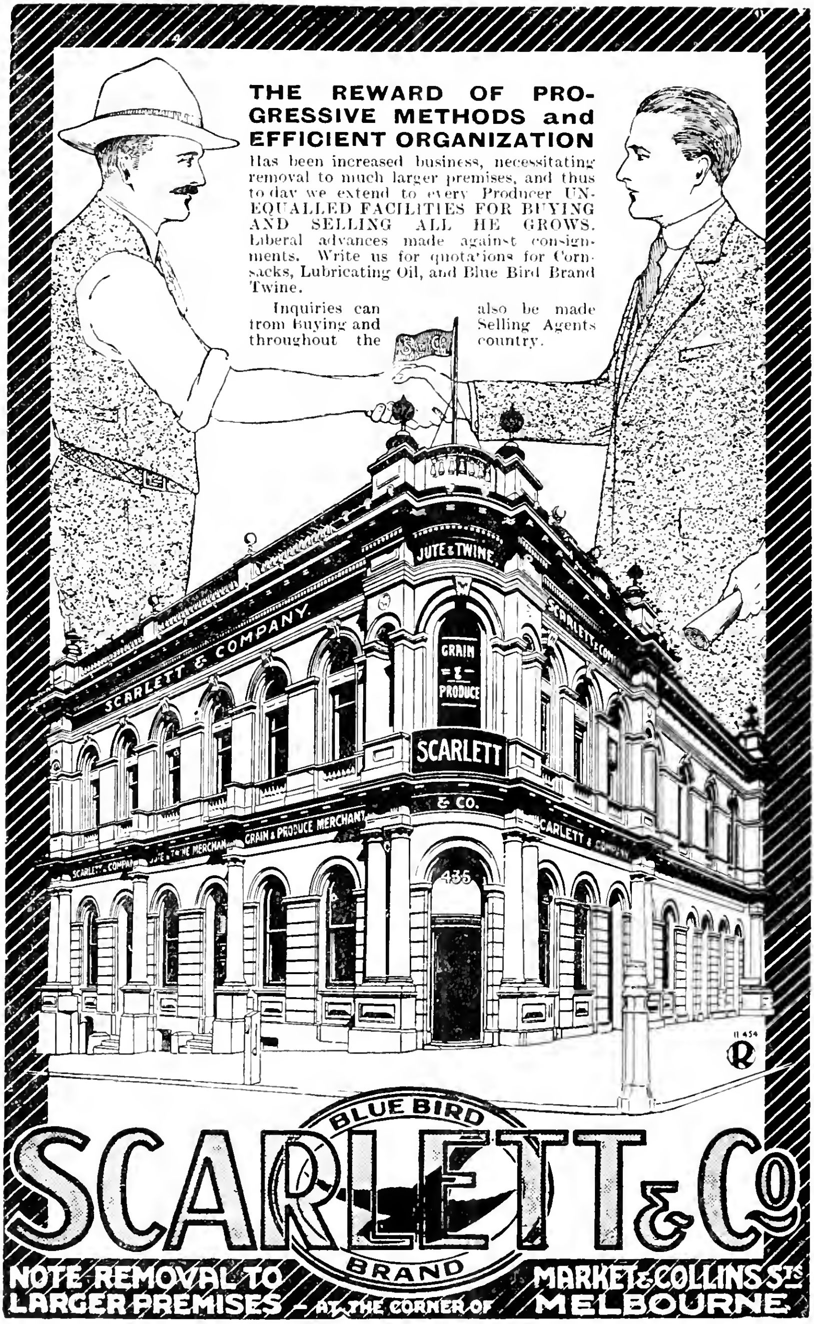
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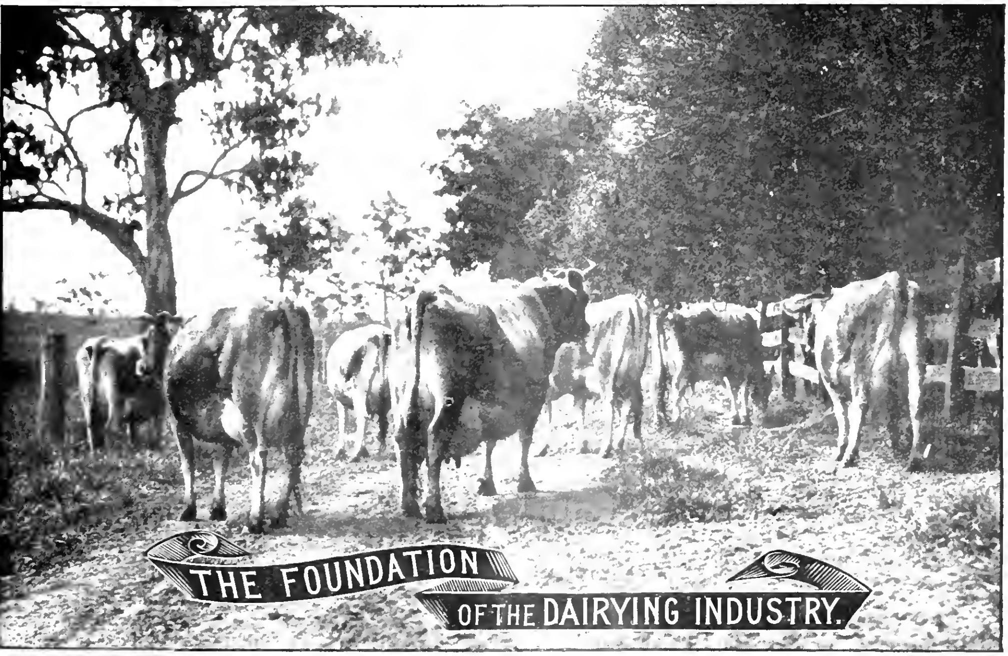

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Vol. XVI. Part 9. 10th September, 1918.

THE STANDARD HERD TEST.

Sixth Annual Report on the Testing of Pedigree Herds, conducted by the Department of Agriculture, Victoria, for the Year ended 30th June, 1918.

By R. T. Archer, Senior Dairy Inspector.

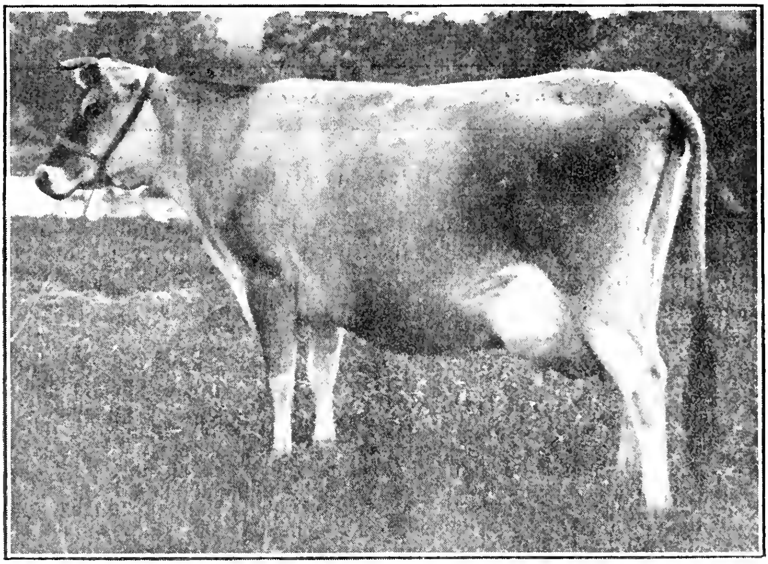
The Sixth Year of the Standard Herd Test has now been completed and some very interesting and valuable results have accrued. It is very pleasing and encouraging to note the increased interest being taken in the system by farmers and others, although some of our chief breeders have not so far decided to submit their cows to the only impartial test of their value from a dairyman's point of view, *i.e.*, the scales and Babcock Tester. The time is at hand when the principal factor in fixing the value of a cow of any of the dairy breeds will be the amount of milk and butter-fat she is capable of producing rather than the points that are considered in the show ring. Of course, when butter-fat producing qualities are combined with physical appearance as in such animals as Sweetbread and Mercedes Noble Queen among the Jerseys, Scottish Queen and Laura IV. among the Ayrshires and other handsome high-producing cows in these and other breeds, we have what may, perhaps, be called the ideal type of cow. However, it is to the heavy producers that we must look for progeny to increase the average producing capacity of the dairy herds of the State. Consider what it means.

It is estimated that the average production of butter-fat per cow in Victoria is about 140 lbs. At pre-war price, *i.e.*, 1s. per lb., the financial return would be £7 per cow. Compare this with the return from the herd of Mr. J. D. Read. Six years ago nine of Mr. Read's cows (including two first calf heifers) averaged 264 lbs. of butter-fat (at 1s., £13 2s. per cow). This past season twenty-three cows, including seven first calf heifers, nine second calf heifers, and seven mature cows, averaged 341 lbs. of butter-fat (at 1s. per lb., this means £17 1s. per

13142.

cow), or an increase of 77 lbs. of butter-fat per cow. In 1912-13 season Mr. Read's herd averaged 498 gallons of milk, while for the 1917-18 season the twenty-three cows and heifers gave an average of 622 gallons —an increase of 124 gallons per cow. The lowest record for the year is that of Holly, a first calf heifer, whose yield was 277 lbs. of fat. The increased results are partly due to better methods of feeding and management, and it is by keeping the records of milk and ascertaining its butter-fat value that Mr. Read was able to prove that his herd would more than pay for liberal feeding.

We often hear the complaint that cows on comparatively poor land cannot be expected to thrive as well as those on rich pastures, yet Mr. Read's farm is in light country, and his is the only herd in the district

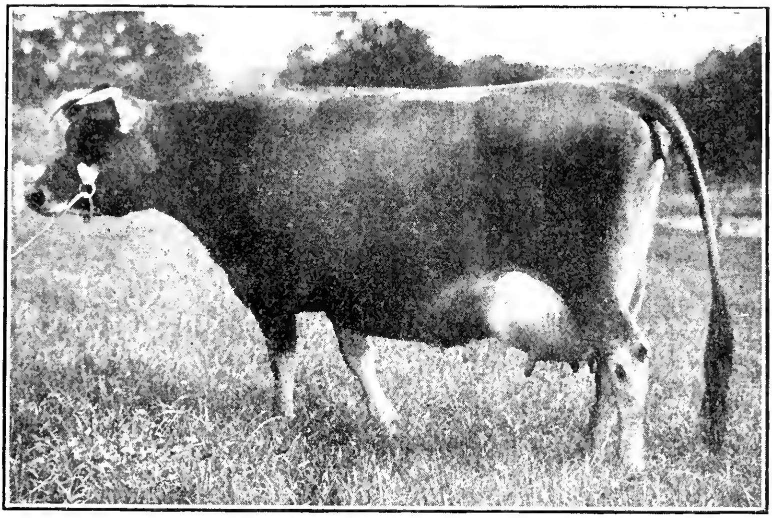


Mr. C. Gordon Lyon's "Velveteen."

Year.	Milk.	Test.	Butter Fat.	Last day of test.
	lbs.	%	lbs.	lbs.
1915	8,361	4·59	383·98	23
1916	7,400	4·62	341·68	16
1917	10,434	4·67	487·73	27

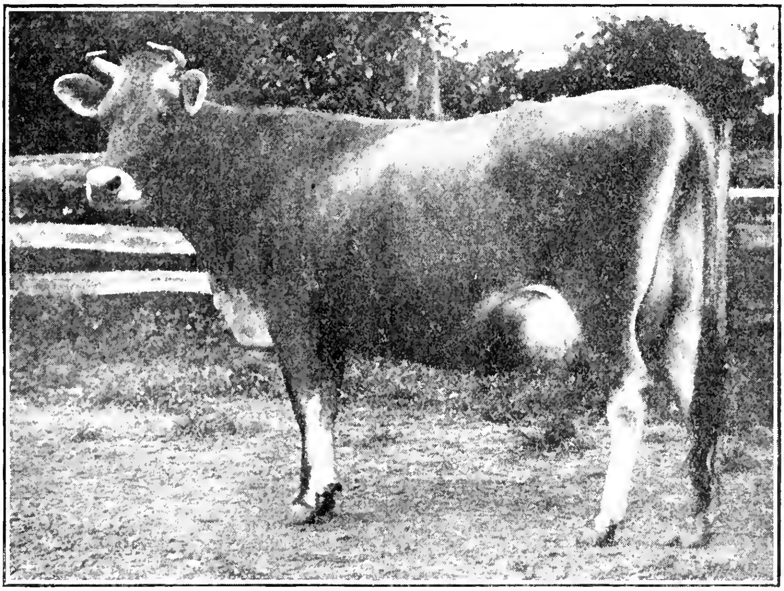
on that class of land, the land there being chiefly devoted to the growing of wheat and the grazing of sheep. Throughout the season the cows are fed in the bails at milking time on a mixture of concentrates, and care is taken to see that milking takes place at regular hours. No chaff is given. The amount of feed varies according to the quantity of milk being produced and the condition of the cows. Heifers about to calve are also fed in the bails.

This year the leading cow in Mr. Read's herd is Trefoil on her second calf, and her record is 426 lbs. of butter-fat. Last year, as a heifer, she produced 326 lbs. of fat. Nightshade, which headed the herd list in 1916, is third this year with 418 lbs. Lucerne, a first-calf heifer and full sister to Trefoil, made 305 lbs. of fat this year.



Mr. C. Gordon Lyon's "Molly 4th of Banyule."

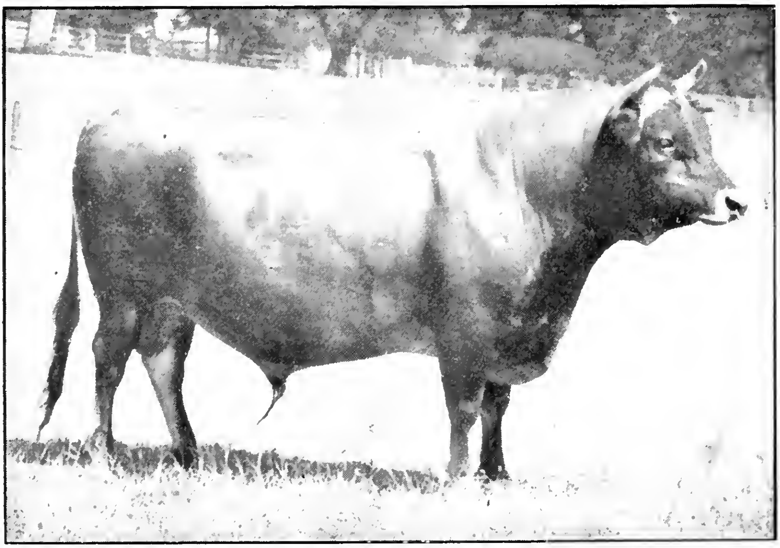
Year.	Milk. lbs.	Test. %	Butter Fat. lbs.	Last day of test. lbs.
1915 (first calf)	5,622	5·38	302·28	9½
1916	7,491	5·24	392·85	13½



Mr. C. Gordon Lyon's "Silvermine 13th," by "Mabel's Chief."

Year.	Milk. lbs.	Test. %	Butter Fat. lbs.	Last day of test. lbs.
1917 (first calf)	5,636	5·41	305·18	15

The Princess family in this herd provides a good illustration of the transmission of butter-fat producing qualities. Princess this season yielded almost 395 lbs., and 414 lbs. last year. Her daughter, Princess Defiance, gave 322 lbs. in 1917 on second calf, and 415 lbs. for 1918. Infanta, a full sister to Princess Defiance, made 281 lbs. fat as a two-year-old, and Banksia, also a two-year-old and daughter of Princess Defiance, yielded 308 lbs., while Czarina, full sister to both Princess Defiance and Infanta, produced 383 lbs. This transmission of power to produce large quantities of milk and butter fat is very strikingly illustrated in the detailed family tree of the Jessie family, so largely represented in Mr. Woodmason's Melrose herd. Details of other families will be given at a later date. Mr. Read's herd, which

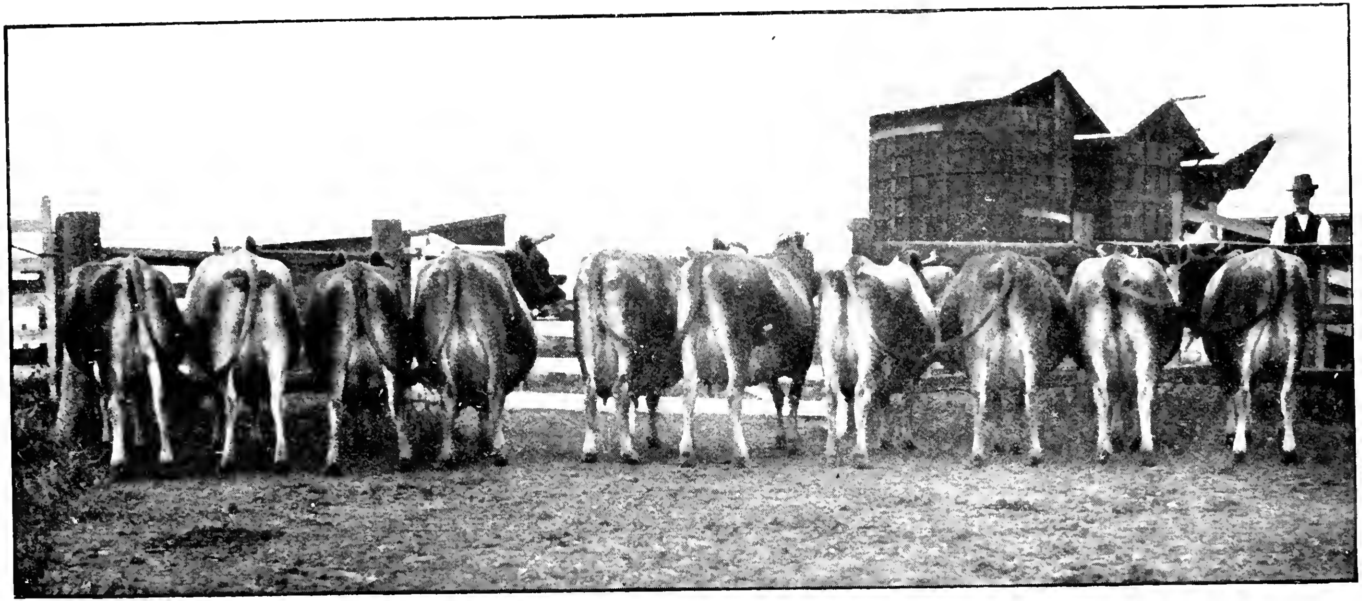


"Mabel's Chief." (imp.).—The sire of many good heifers.

gains second prize this year, has shown an average increase in butter-fat production of 77 lbs. per cow during the six years they have competed in the Standard Herd Test.

What is to prevent similar methods being applied to the dairy herds of this State generally? Only the easy-going apathy of the farmers themselves. What would be the result in the dairy industry of the State if similar methods were generally adopted? Suppose we could obtain an improvement of 40 pounds per head from each of the 600,000 dairy cows in Victoria. At 1s. per lb. it would give the dairy farmers an increased return of £1,200,000 per annum, to say nothing of the increased profit from calves and skim milk.

During the year Mr. C. Gordon Lyon's Velveteen II. gave 10,434 lbs. of milk, 487 lbs. of fat, and 27 lbs. of milk on the last day of the test. Last year her yield of butter-fat was 341 lbs.



"Udder Development."

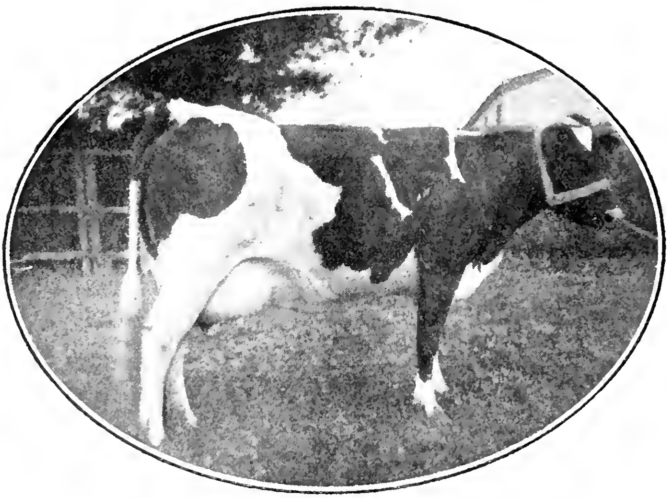
Some Members of Mr. Gordon Lyon's Herd. (Note Silos.)

Reading from the left—	Milk. lbs.	Butter Fat. lbs.
Colleen Bawn	..	..
Velveteen	10,434	487
Molly 4th	7,491	392
Silvermine 3rd	8,266	426
Silvermine 4th	7,364	395
Silvermine 13th (first calf)	5,636	305
Captor's Thora	7,398	404
Majesty's Starbright	6,835	380
Parrakeet	9,827	439
Parrakeet 2nd	..	..

In Mr. Lyon's herd several good families are represented. It includes the Molly family, a member of which is Molly II., and her record is worth reproducing. It is as follows:—

Year.	Milk.	Test.	Fat.	Milk on Last Day of Test.
	lbs.		lbs.	lbs.
1912–13	7,440	4·85	361	17½
1913–14	7,429	4·97	369	17
1914–15	8,043	5·03	404	15
1915–16	8,708	4·84	421	16
1916–17	7,532	4·90	369	12
Average	7,830	4·92	385	15½

In the recent test Molly IV. gave 302 lbs. of fat, and Molly V., a first calf heifer, 300 lbs. The Lassie and Silvermine families are



Mr. A. W. Jones' "May Queen" (Friesian).

	Milk.	Test.	Butter Fat.	Last day of test.
	lbs.	%	lbs.	lbs.
First calf	9,386	4·37	410·39	30

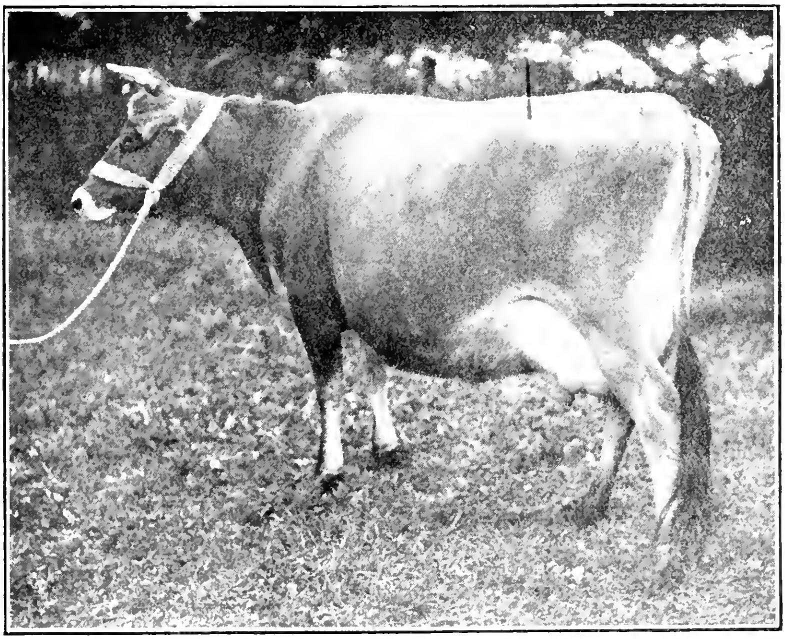
well established. The Music family holds some very interesting records, including that of Soprano, 463 lbs. fat, and Chorus, 411 lbs.

The main object of the Standard Herd Test is to discover females whose male progeny will be of most value to dairy farmers desiring to improve the yield of their cows. With the object of showing the influence and importance of a good sire in improving yields, records of some of the progeny of Mr. W. Woodmason's imported bull Pretty Noble were published in the *Journal* for September, 1916. Hereunder is reproduced the results of heifers by Mabel's Chief (imp.), the property of Mr. Gordon Lyon. Unfortunately, both Pretty Noble

and Mabel's Chief died in the prime of life, and their loss to the dairying industry may perhaps without extravagance be spoken of as a national one.

MABEL'S CHIEF HEIFERS, 1917-18.

Name.	Milk.	Test.	Fat.	Butter.	Milk Last Day.
	lbs.		lbs.	lbs.	lbs.
Silvermine 14th	6,067	4·95	300·14	342	21½
Silvermine 13th	5,636	5·41	305·18	348	15
Molly V.	5,342	5·63	300·95	343	13½
May X.	4,527	4·94	223·57	255	13½
May IX.	5,251	5·00	262·81	299	16½
Hawthorn V.	5,247	5·46	286·37	326	14½
Hawthorn IV.	4,998	6·10	304·90	347	13½
Creamcake	5,278	6·17	325·80	371	16
Whitebread	6,786	5·40	366·61	418	24
Gingerbread	5,339	5·78	308·87	352	14½
Average	5,447	5·47	298·20	340	16¼

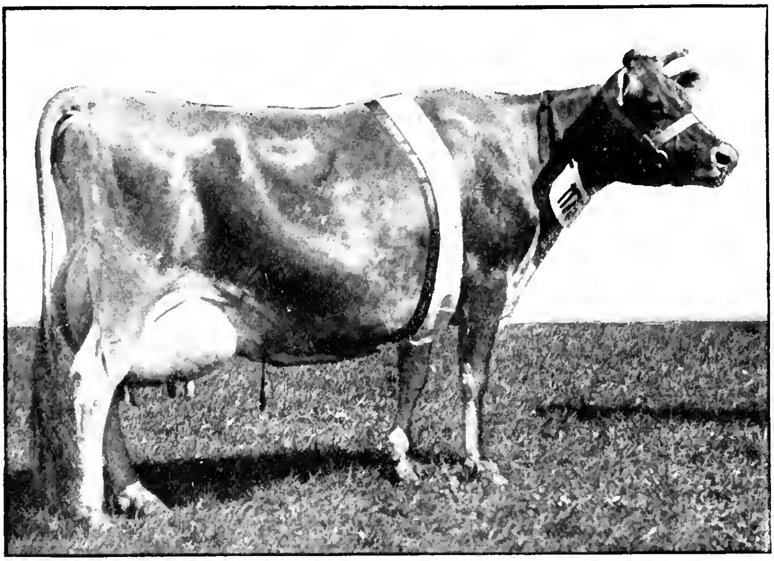


Mr. A. W. Jones' "Jubilee 15th."

Year.	Milk.	Test.	Butter Fat.	Last day of test.
	lbs.	%	lbs.	lbs.
1917	7,694	5·60	431·10	21½
1918	9,361	5·33	499·55	25

At the beginning of the last test Mr. C. G. Knight's herd was just recovering from the effects of the drought. Mixed concentrates, together with the usual amount of soaked chaff, are always fed to the herd. The satisfactory improvement during the past year is largely due to the interest and kindly attention of the younger members of Mr. Knight's family to the dairy stock.

Arcadia, winner of the *Weekly Times* Dairy Test at the Royal Show of 1917, leads the herd for the second time in succession. This year her record is 479 lbs. fat; last year it was 441 lbs. Royal Rose, dam of Arcadia, yielded 345 lbs., while Foxglove, a daughter of the latter, gave 405 lbs., and Primrose, a half-sister, 358 lbs. Mythic, a



Mr. C. D. Lloyd's "Sweetbread 24th."

Year.	Milk.	Test.	Butter Fat.	Last day of test.
	lbs.	%	lbs.	lbs.
1914	8,421	5·84	492·19	24
1915	8,504	5·67	482·26	17
1916	8,484	5·33	452·42	16
1917	8,608	5·39	464·20	11
1918	8,372	4·82	403·61	17

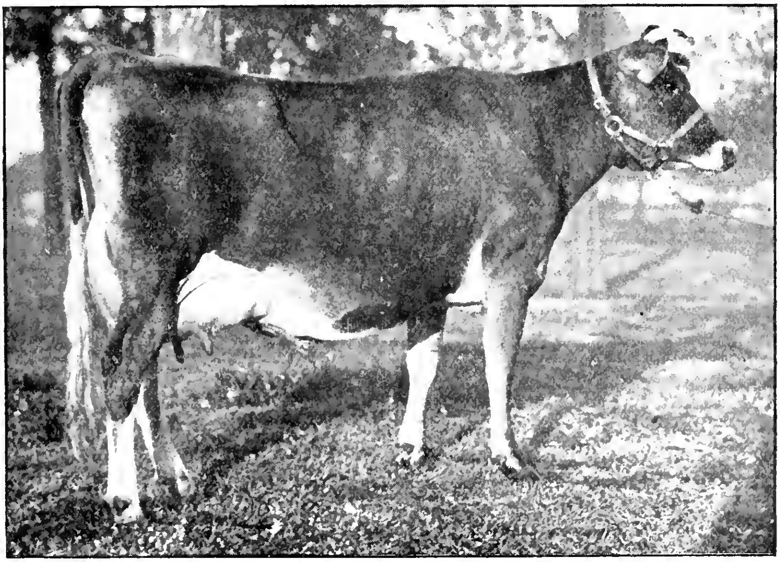
member of the Magnet family, and related to Mr. J. D. Read's Nightshade, is second in the herd with 474 lbs. of fat. Six cows each gave over 400 lbs. of fat, and eighteen, including two first-calf and four second-calf heifers, averaged 6,483 lbs. of milk and 355 lbs. of fat without handicaps.

Mr. F. Bidgood's name has not previously appeared in a herd testing report. He has made a good beginning with Miss Twilight, with 301 lbs. of fat to her credit on her first calf. It is anticipated that some good records will be made by the cows of this herd in the future, as great interest is taken in their feeding and management.

Mr. C. D. Lloyd's Sweetbread XXIV. keeps up her reputation, and her five years' record is some indication of her value and constitution—

Year.	Milk.	Test.	Fat.	Milk on Last Day of Test.
	lbs.		lbs.	lbs.
1914	8,421	5·84	492	24
1915	8,504	5·67	482	17
1916	8,484	5·33	452	16
1917	8,608	5·39	464	11
1918	8,372	4·82	403½	17
Average	8,478	5·41	459	..

Sweetbread's two-year-old heifer Whitebread made a good start in the last test with a total of 6,788 lbs. of milk and 366 lbs. of fat.



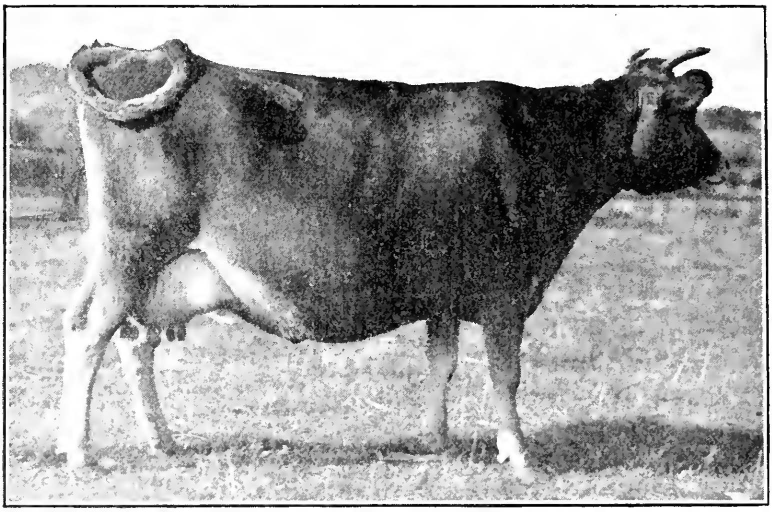
Mr. C. D. Lloyd's "Whitebread," ex "Sweetbread," by "Mabel's Chief."

Year.	Milk.	Test.	Butter Fat.	Last day of test.
	lbs.	%	lbs.	lbs.
1918 (first calf)	6,786	5·40	366·61	24

Mr. Wm. Woodmason's Melrose herd obtains the Herd Prize for the year under the Standard Herd Test. This is a splendid performance, considering the size of the herd. Eighty-two cows completed the test during the year, including twenty-three first-calf and nineteen second-calf heifers. The whole herd averaged 5,926 lbs. of milk and 345 lbs. of butter-fat. Jessie VI. of Melrose wins the championship for the highest individual result. On another page will be found

the full record of this cow, included with the Jessie family tree and records. The possession of complete information of the individual performances of members of herds is an advantage held by those who entered their herds from the commencement of the tests six years ago, and this fact increases enormously the value of those families shown to be consistent producers.

One of the most valuable results of the Standard Herd Test has been its proving the dominance of production in certain families from members of which records have been obtained. These results will be reproduced from time to time. Those given on page 523 of the "Jessie" family are most striking, and will repay investigation. This family originated from Jessie, by Freetrader out of a cow imported by the late Mr. Edward Wilson. Jessie was awarded first prize at



Mr. W. Woodmason's "Jessie VI. of Melrose."

Year.	Milk.	Test.	Butter Fat.	Last day of test.
	lbs.	%	lbs.	lbs.
1915	7,924	6·71	532·17	21½
1916	8,342	6·27	523·34	13½
1917	7,691	6·74	518·35	24½

the National Show, Melbourne, in 1884, at the age of sixteen years. She must have transmitted her constitutional longevity to her progeny, for Jessie's Progress, born September, 1897, whose photograph is reproduced on page 524, is now twenty-one years old, and still "doing well."

This year, for the first time, we have represented a breed that is rapidly growing in favour in practically every country where dairying is of importance, viz., the Friesian, or, as they are often called, Holstein Friesian. There are now three herds of this breed being tested, the owners being Mr. O. J. Syme, Bolobek, Macedon; Mr. A. W. Jones, St. Albans, and the Department of Agriculture. Mr. Jones' Friesian heifer May Queen was first in the heifer class. She calved at two

JESSIE (by Freetrader), out of a cow imported by the late Edward Wilson. (Jessie was awarded 1st prize at National Show 1884, when 16 years old).
Jessie 2nd (by Peter III.)
Jessie 3rd (by Brilliant).
Jessie 4th (by Jim).

Jessie's Progress (born 1897), by Lady Superior's Progress—

	Milk. lbs.	Test. %	Fat. lbs.	Milk. last day.
1913 ..	6,379	6·38	457	18½
1915 ..	7,784	5·96	464	18
1916 ..	5,916	6·23	369	19

Jessie XI. of Melrose, by Mystery's Son of Melrose—

	Milk. lbs.	Test. %	Fat. lbs.	Milk last day.
1913 ..	3,674	6·5	235	15 (210
1914 ..	7,108	5·9	420	15 days)
1915 ..	7,317	5·9	430	16½
1916 ..	6,986	6·24	436	18
1917 ..	6,065	6·59	369	11½

Jessie's Progress III. by King of Melrose—

Noble Jessie, by Noble Lord (imp.)—

	Milk. lbs.	Test. %	Fat. lbs.	Milk last day.
1917 ..	5,575	5·6	316	11½

Judith, by Starbright's Fox—
302 lbs., 273 days.

Judith II. by Noble Lord (imp.)—
268 lbs. in 273 days.

Jessie's Progress II. by Royal Blue—

Wilful Venture, by Wild Rover—

1913 ..	6,381	5·9	379	14½
1914 ..	6,872	6·2	431	19
1915 ..	7,429	6·4	479	19

Jessie II. of Melrose, by Lady Superior's Progress—

Jessie X. of Melrose by Wild Rover—

1913 ..	5,962	6·15	366	13½
1914 ..	6,769	5·72	387	13½
1915 ..	6,716	5·24	352	14
1916 ..	5,980	5·61	307	11½

Jessie XIX., by Handsome Boy III.—

1917 ..	3,785	5·9	226	12

Calved premature.

Jessie IV. of Melrose by Handsome Hero—

Jessie IX. of Melrose, by Wild Rover—

1913 ..	4,223	5·67	240	19
1914 ..	6,785	5·59	379	21
1915 ..	7,359	5·69	418	22
1916 ..	6,961	5·32	370	26
1917 ..	7,159	5·5	393	19

Jessie XII. of Melrose, by Pretty Noble (imp.)—

	Milk. lbs.	Test. %	Fat. lbs.	Milk last day.
1914 ..	5,063	5·9	303	18
1916 ..	6,296	5·9	374	13
1917 ..	7,270	6·19	450	18½

Jessie V. of Melrose by Royal Blue (born 1905)—

1913 ..	7,487	5·60	419	24
1914 ..	7,919	5·26	417	19½
1915 ..	7,452	5·25	491	19
1916 ..	6,279	5·12	321	15
1917				

Jessie VIII. of Melrose, by Wild Rover—

1913 ..	6,554	6·27	411	15½
1914 ..	7,268	5·28	384½	18

Jessie XV. of Melrose, by Pretty Noble (imp.)—

1916 ..	4,113	6·37	270	10½
1917 ..	5,229	6·27	325	11½

Jessie XVI. of Melrose, by Handsome Boy II.—

1917 ..	4,207	6·8	287	15

Jessie XIII. of Melrose, by Pretty Noble (imp.)—

1915 ..	5,261	6·21	327	13½
1916 ..	6,299	6·38	401	13½
1917 ..	7,420	6·29	467	15½

Jessie XIV. of Melrose, by Pretty Noble (imp.)—

1916 ..	5,692	5·9	340	14
1917 ..	5,886	5·9	347	16

Jessie XVIII., by Topnotch—

1917 ..	5,202	5·83	303	11½

Edith of Melrose (13 years old), by Beauty's Milkman—

1914 ..	8,445	4·89	395	18

Edith V. of Melrose, by Jessie IV. Son of Melrose—

1914 ..	5,818	5·48	296	14
1915 ..	6,630	4·73	313	18½
1916 ..	5,466	5·15	281	14½

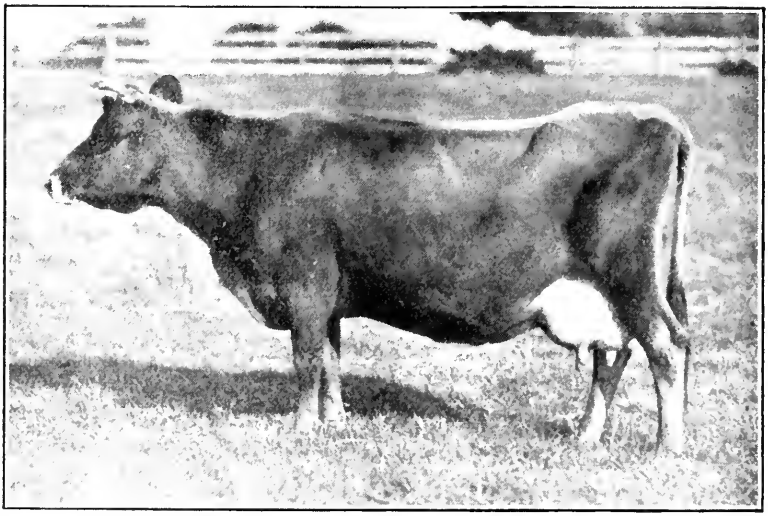
Jessie VI. of Melrose, by Wild Rover—

1914 ..	7,924	6·71	532	21½
1915 ..	8,342	6·27	523	13½
1916 ..	7,691	6·74	518	24½

Jessie XVII. of Melrose by Handsome Boy III.—

1917 ..	4,046	7·01	283	11

years and ten months old, and in nine months gave 9,386 lbs. of milk of 4.5 per cent. test, 410.39 lbs. butter-fat, and 30 lbs. of milk on the last day of the test. The herd of the Department of Agriculture was imported from New Zealand, and should prove a valuable addition to those already in this country. Mr. Syme's Duplicate Posch Maud gave 10,762 lbs. of milk of 3.63 per cent. average test, 390¾ lbs. fat and 22½ lbs. of milk on the last day; while Bolobek Belle, on her second calf, gave 10,174 lbs. milk of 3.77 test, 384½ lbs. fat, and 29½ lbs. milk on the last day. Another first-calf heifer gave 9,055 lbs. of milk of 3.52 per cent. test, 319½ lbs, fat, and 21 lbs. milk on the last day of the test. Though the Friesian cattle generally have a low test, it will



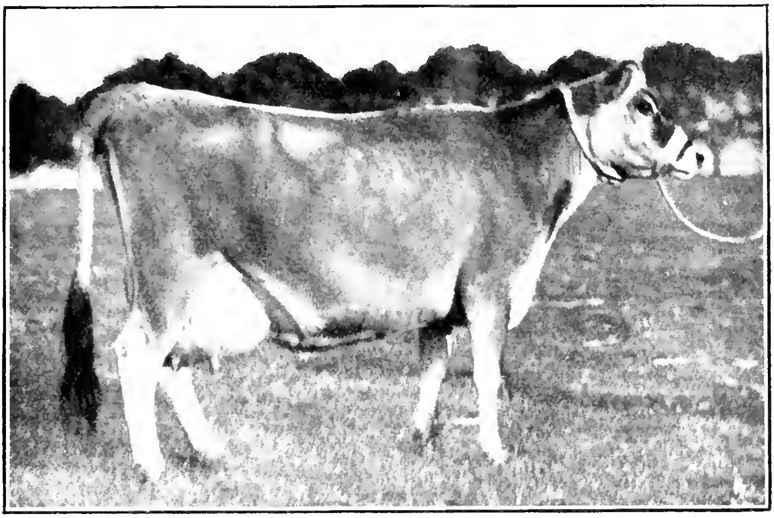
Mr. W. Woodmason's "Jessie's Progress."

Year.	Milk. lbs.	Test. %	Butter Fat. lbs.	Last day of test lbs.
1914	6,379	6·38	406·94	18½
1915	7,784	5·96	464·28	18½
1917	5,916	6·23	368·84	19

be noticed that the average of Mr. Jones' May Queen was 4.5. There is no reason why the average test of this breed should not be considerably improved by judicious selection and breeding.

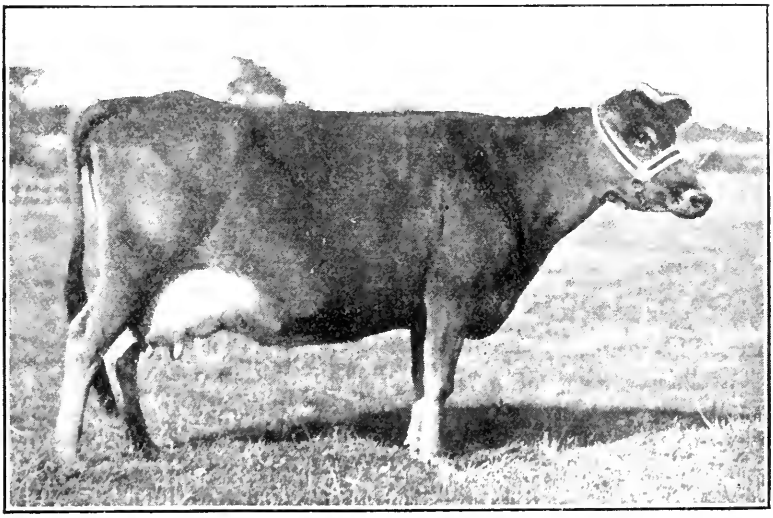
Several herds of Ayrshire were included in the test just completed, but many of the leading breeders still neglect to avail themselves of the opportunity to prove the worth of this handsome breed of cattle. Mr. W. Greaves' "Warrook" herd bids fair to improve the reputation of the breed, and this year his herd gained an average of 7,575 lbs. of milk and 338 lbs. of butter-fat.

Milking Shorthorns are again represented in Mr. Atkinson's herd. This is a breed that has been very much neglected in this country, and in the home of the Milking Shorthorn it is only quite recently



Mr. W. Woodmason's "Rarity 6th of Melrose."

Year.	Milk. lbs.	Test. %	Butter Fat lbs.	Last day of test. lbs.
1915 (second calf) ..	6,421	5·88	377·47	13½
1916	8,023	5·28	423·48	18½
1917	8,070½	4·92	396·77	18½
1918	8,839	5·10	450·57	21½

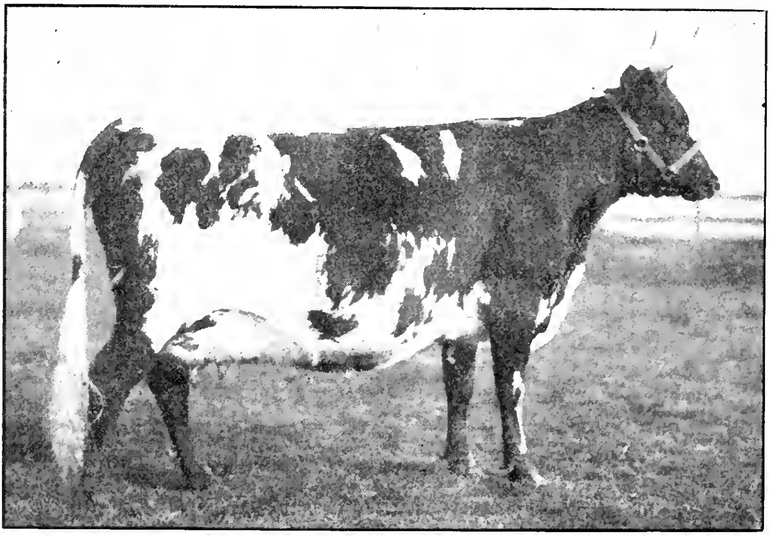


Mr. W. Woodmason's "Quality 6th of Melrose."

Year.	Milk. lbs.	Test. %	Butter Fat. lbs.	Last day of test. lbs.
1915	7,158½	5·83	417·45	22
1916	8,349½	5·73	478·44	18
1917	8,327	5·24	436·73	24
1918	8,494	5·31	451·29	26

that a Herd Book has been formed. The results from the "Darbalara" herd in New South Wales show what this breed can do when bred and managed on sound lines. Melba VII. of Darbalara produced over 1,000 lbs. of butter in twelve months. Mr. Atkinson has a Darbalara bull at the head of his herd, and good records from this herd may be looked for in the future.

Some of the beneficial results of the operation of the Standard Herd Test are well illustrated in the experience of Mr. A. W. Jones, St. Albans. When he started his herd he attended clearing sales of pure Jerseys in South Australia. Mr. Jones showed the writer his marked catalogues, and the prices ranged from five to twenty-five guineas. The herd was submitted to the scales and Babcock test, and



Mr. W. C. Greaves' "Letty of Warrook."

Year.	Milk. lbs.	Test. %	Butter Fat. lbs.	Last day of test. lbs.
1917 (first calf)	5,343	5·21	278·47	20

the result showed that Mr. Jones had become possessed of some very valuable cattle. The following year he returned to South Australia to purchase more of the same strains, but he found that the fame of his cows had preceded him, and that dairymen there appreciated their value as well. Consequently Mr. Jones could not buy for less than fifty guineas. He purchased all the cattle of the "Lady Grey" strain, but one owned by Mr. Peter Wood. This one Mr. Wood would not sell at any price. It is safe to say that the herd test has increased the value of Jersey cattle from 50 per cent. to 100 per cent.

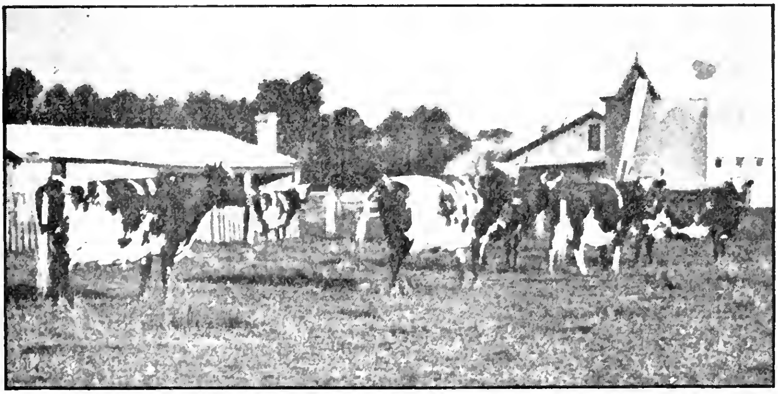
Mr. Edward Hayes, of Archie's Creek, informed an officer of the Department of Agriculture that the entry of his herd in the Standard Herd Test meant a gain to him of fully £100, chiefly from the advice

on the feeding of cows given by visiting officers. Owing to ill-health, Mr. Hayes had to relinquish dairy farming temporarily, and has sold all his cattle. As the official records of the yields of the cows were available, they brought prices far in excess of what would otherwise have been offered. It is also interesting to add that the improved method of feeding at Mr. Hayes' farm became an invaluable object-lesson in the district.

Mr. Trevor Harvey, of Boisdale, bought two heifers at Mr. Jones' sale for nine guineas each. Dainty VI. has since given the following results:—

Year.	Age.	Milk.	Test.	Butter Fat.	Milk on Last Day of Test.
		lbs.		lbs.	lbs.
1915-16	2 years	5,306	5·66	300½	19½
1916-17	3 years	5,985	5·57	333¼	7½
1917-18	4 years	9,189	5·14	473	10

This cow is by Young Black Antimony, and is out of Dainty V., by Navigator, thus combining at least two excellent milk and butter producing strains. Her value is now much more than 100 guineas.

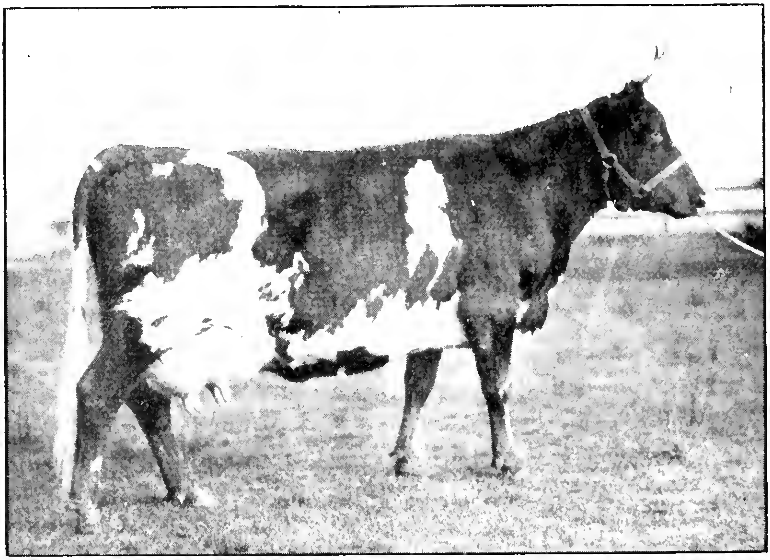


Mr. W. C. Greaves' Ayrshire Herd.

Note reinforced brick silo, which has been in regular use for eight years.

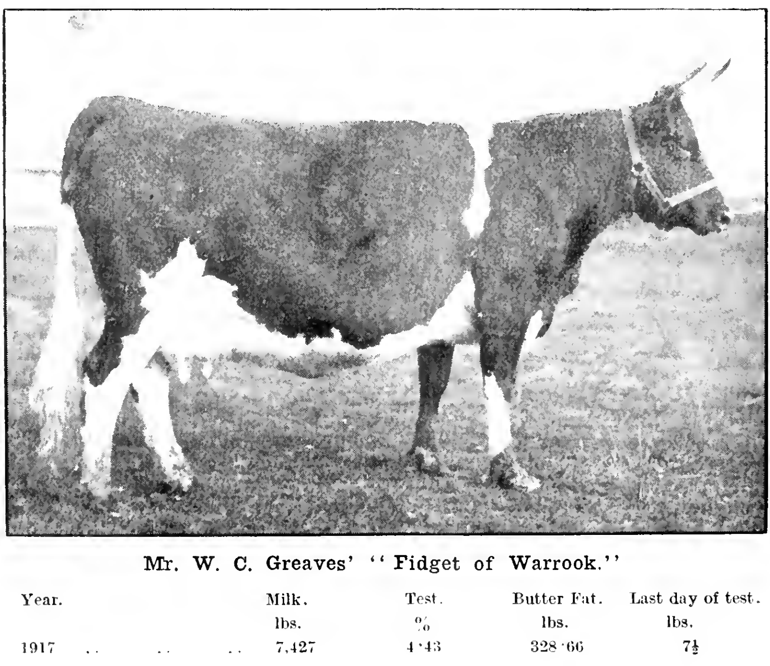
Mr. Harvey depends principally on grazing, green oats and millet. Maize is grown also for summer feeding and conversion into silage for winter. Silage is an important factor on Mr. Harvey's farm. Concentrates and chaff are regularly fed in the bails.

During the year 1915-16 three cows belonging to the Leongatha Agricultural High School were tested by the Department of Agriculture



Mr. W. C. Greaves' "Vanity of Warrook."

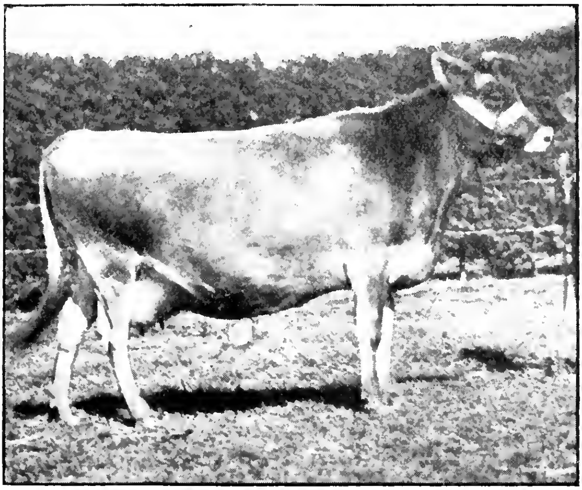
Year.	Milk.	Test.	Butter Fat.	Last day of test.
	lbs.	%	lbs.	lbs.
1918	8,241	4·64	382·26	12



Mr. W. C. Greaves' "Fidget of Warrook."

Year.	Milk.	Test.	Butter Fat.	Last day of test.
	lbs.	%	lbs.	lbs.
1917	7,427	4·43	328·66	7½

Mr. J. D. Read's Springhurst herd of Jerseys.

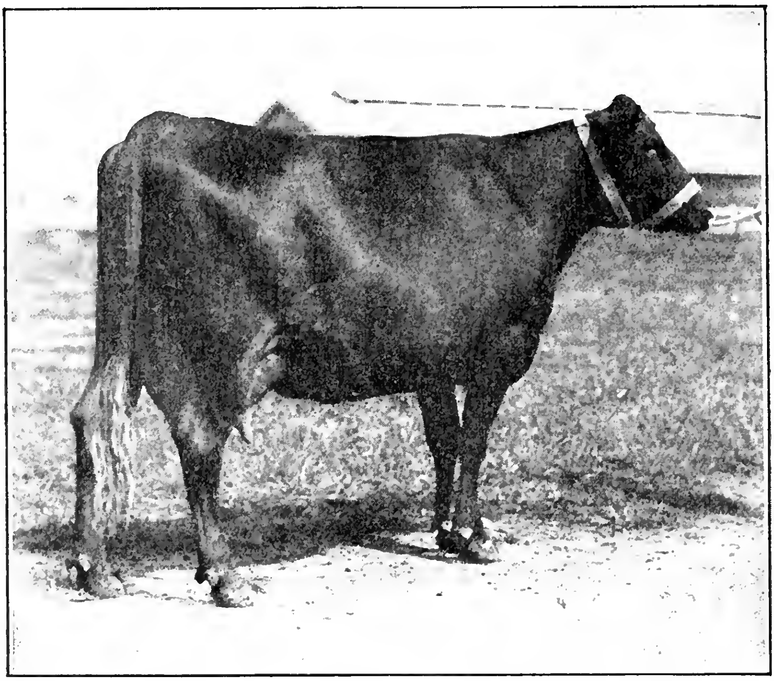


"Mona."—One of the Competitors from the Leongatha Agricultural High School.

Year.	Milk.	Test.	Butter Fat.	Last day of test.
	lbs.	%	lbs.	lbs.
1918	10,344	4·65	480·95	22

under the Standard Herd Test, and the same three have been tested during the 1917-18 season. The results are very striking—

Cow.	Year.	Milk.	Test.	Butter Fat.	Milk Last Day.	Price.	Total Return from Milk.	Skim Milk.	Return from Skim Milk at 1d. per gal.
		lbs.		lbs.		s. d.	£ s. d.	galls.	£ s. d.
Mona ..	1915-16	5,509	4·78	263½	11	1 4	17 12 8	495	2 1 3
,, ..	1917-18	10,356	4·61	477¾	26½	1 4	30 3 3	932	3 17 6
First Choice	1915-16	2,886	6·33	182½	4½	1 4	12 3 6	159	0 13 3
,,	1917-18	6,830	5·98	406	15½	1 4	25 7 8	514	2 2 10
The Gift ..	1915-16	2,913	5·35	156	Dry	1 4	10 8 0	162	0 13 6
,, ..	1917-18	6,933	4·95	343½	21½	1 4	22 18 0	624	2 12 0

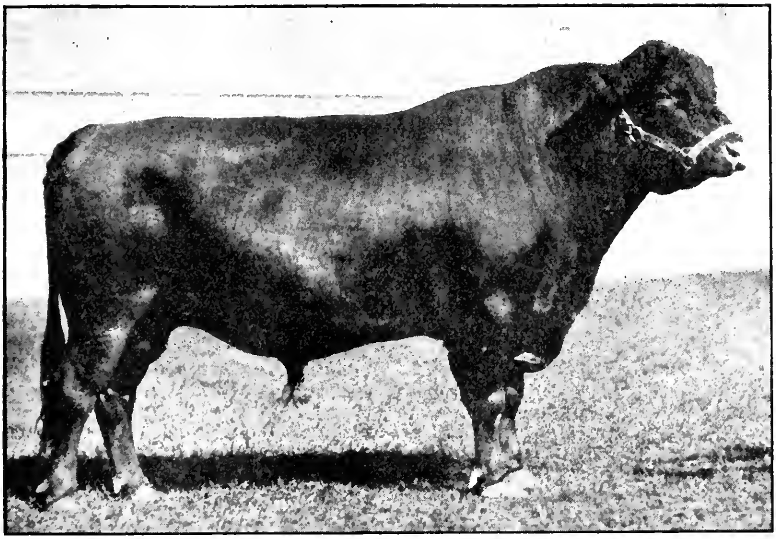


"Mongolia."—One of the Werribee Research Farm Red Poll Herd.

Year.	Milk.	Test.	Butter Fat.	Last day of test.
	lbs.	%	lbs.	lbs.
1915	5,524	4·18	231·23	15½
1916	7,415	4·30	319·81	10
1917	7,704	4·18	322·15	12½
1918	8,642	4·44	384·09	22

The question which naturally arises is, "Why have these cows given so much better results the second year?" The answer is simple. During the first season the manager was not allowed to purchase any concentrates (*i.e.*, bran, oil-cake, &c.), and the cows were grazed only

on grass or green crop, which was not sufficient to enable them to give good returns. The second year concentrates were available, and the yields were increased twofold. One cow tested in the first year did not give enough milk to pay for her food and she was sent to the butcher, although she had been awarded a prize at the Show. With rich milking Jersey cows the standard rule the world over is to give one pound of concentrates to each three pounds of milk they give. Working on this basis with Mona, and taking bran as a standard, she would consume $1\frac{1}{2}$ tons, or £7 10s. worth. Allowing that she had the



"Longford Major" (imp.) (by "Longford Majiolini" ex "Mona") of the Werribee Research Farm Red Poll Herd.

Dam's record ..	14,713 lbs. milk	.. 6 years' average..	10,548 lbs. milk
G. Dam's record ..	10,548 ,,	.. 4 years' average..	9,155 ,,

same roughage as the previous year, she would give a profit of £7 over the extra cost of feed, to say nothing of the increased value of the manure due to the concentrates. If oats and lucerne are grown and the former threshed, crushed and fed to cows, no concentrates would need to be bought; but phosphates would be required for the growing of the crops. The experience of nearly all those having their cows tested goes to prove that the good cow gives a handsome profit for concentrates fed. Of course, it is not wise to over-feed stock. Rational feeding should be the aim.

An outstanding feature in connexion with Herd Test operations is the part ensilage plays in feeding on many of the farms. It is abundantly proved that silage is a very valuable food. There is something indefinable in it to which the cows respond very readily. Amongst those using ensilage largely may be mentioned Messrs. Gordon Lyon,

A. W. Jones, W. Greaves, J. D. Read, Trevor Harvey, the Geelong Harbor Trust, Wm. Parbury, O. J. Syme, and the Department of Agriculture. Ensilage is the cheapest fodder of a succulent nature that can be conserved. In those places where strict account has been kept of all the expenses in connexion with growing and saving, it works out at about 7s. 6d. per ton in the silo.

To show the apathy that exists among farmers in some districts, the following incident, which occurred at a clearing sale recently, is worth recording. It was a sale of pure Jersey cattle, which are being tested under the Standard Herd Test scheme. All the old rubbish about the place, broken harness and old iron, were carefully collected and put into heaps. These lots all sold readily at many times their value. At last a four-bottle Babcock Tester, with acid and glassware all complete, was offered, but not a bid came for this lot. The auctioneer, trying hard, said, "Any one give a pound for it?" but there was no response. "Any one say 10s.—5s.? Any one give a bob for it?" and still no reply. "Any one have it as a gift?" and, I understand, no one would even take it. The owner had no use for it, as the Government was testing his cows.

In 1914 a Herd Testing Association was started in the Colac District. There are nearly 30,000 cows in the district supplying the Colac Dairy Company, owned by about 1,200 dairymen. Only forty-five of these owners have patronized the Herd Test Association, and last year only 1,600 cows were tested, and this is the only milk testing association operating in Victoria. Until there are some means adopted to awaken the interest of owners of dairy cattle in this most important phase of the industry, there is not likely to be much development. The cost per cow for testing in the Colac Society is 2s. 9d. The experience of the Ayrshire breeders in Scotland may be of interest here. From the last annual report of the Scottish Milk Records Association, it is learned that the rate of improvement has been a little over 4 per cent. Taking the last five years, the total cumulative increase in milk yield of 26,000 cows tested annually amounts to over 8,000,000 gallons of milk. From this 8,000,000 lbs. of cheese would be made. At 6d. per lb., this would return £200,000, or £40,000 per annum. It was found that the maintenance of an 800-gallon cow was very little more than that of one giving 500 gallons.

The following are the new herds entered during the year:—Messrs. O. J. Syme, "Bolobek," Macedon (Friesian); A. Schier, Caldermeade (Ayrshire); Meier Bros., Balwyn (Jersey); W. K. Atkinson, Swan Hill (Shorthorn); George Gange, junior, Westmere (Ayrshire); Dr. S. S. Cameron (Jersey); Mr. Parbury, "Brookfield," Warburton (Jersey) J. McKenzie, Glenroy (Jersey).

Since this report was written ten more herds have been entered, and the total number now undergoing test is forty-seven.

I have much pleasure in acknowledging the assistance given in the preparation of this report by Messrs. J. M. Kerr, B. A. Barr, R. R. Kerr, and other members of the staff.

Standard Cow Prizes.

The following prizes were offered by the Government for the year ended 30th June, 1918. The prizes will be awarded through the Royal Agricultural Society:—

1. *Grand Champion Cow*—under Herd Test Regulations.

   A grand champion prize of £100, as a trophy or cash, for maintaining the position of annual champion for three years, not necessarily in succession. Not yet allotted.

2. *Annual Champion Cow*—under Herd Test Regulations.

   A prize of £10, to be awarded to the cow which, during a lactation period terminating within a year ending on 30th June, gives the greatest amount of butter-fat under the herd testing regulations of this Department.

   Won by "Jessie VI. of Melrose"; owner, W. Woodmason.

3. *Reserve Annual Champion*—under Herd Test Regulations.

   A prize of £5 per annum to be awarded to the cow attaining second place under the herd testing regulations of the Department during the year ended 30th June.

   Won by "Jubilee XV."; owner, A. W. Jones.

   These prizes to be awarded conditionally upon the winning cow being exhibited at the next Royal Agricultural Show. In the event of the death of the winning cow prior to such Show, the owner to exhibit his next best cow.

4. *Best Herd*—under Herd Testing Regulations.

   A first prize of £20 and a second prize of £10 to be awarded to the herds giving the greatest average returns under the herd testing regulations of this Department and complying with the following conditions:—

   (1) Minimum number of cows (completing the test during the year) in a herd, 10.

   (2) Such herd to average not less than 300 lbs. of butter-fat.

   (*a*) Handicaps to be allowed on the following scale:—

   i. A herd of more than 10 cows to receive a handicap of ½ lb. of butter-fat for each cow.

   ii. Cows entered under regulation 11A to receive a a handicap of 75 lbs. of butter-fat.

   iii. Cows entered under regulation 11 *b* and *c* to receive a handicap of 50 lbs. of butter-fat.

   The prizes to be allotted for the year ending 30th June, and the three best cows in the winning herd to be exhibited at the next Royal Agricultural Show.

   First prize won by the "Melrose" Herd; owner, Mr. Wm. Woodmason.

   Second prize won by the "Springhurst" Herd; owner, Mr. J. D. Read.

No cow competing for any prize shall be milked more than twice a day, and must re-calve within fifteen months from her previous calving date.

RETURN OF CERTIFICATED COWS FOR YEAR ENDED 30th JUNE, 1918.

W. K. ATKINSON, Swan Hill. (Shorthorn.)

Completed during the year, 2. Certificated 2.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Poplar Vale Princess XXIX.	Not yet allotted	1.9.17	273	14½	5,595	3·92	219·56	175	250¼
Blanche Rose IX. ..	,,	13.9.17	273	16½	6,774	4·01	271·53	175	309½

JOHN BAKER, Gheringhap. (Red Poll.)

Completed during the year, 3. Certificated, 3.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Elcho Lady	Not yet allotted	30.4.17	273	23½	7,028	4·84	340·11	250	387¾
Elcho Maid	,,	25.6.17	273	9	5,510	5·13	282·51	250	322
Karong Belle	,,	29.7.17	273	13½	6,682	5·41	361·62	250	412¼

T. BIDGOOD, Staghorn Flat. (Jersey.)

Completed during the year, 2. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Miss Twilight	Not yet allotted	20.8.17	273	15½	5,788	5·20	301·07	175	343¼
Bluebell II.	,,	19.9.17	273	12	5,869	6·38	374·49	250	427

DEPARTMENT OF AGRICULTURE, Werribee. (Red Poll.)

Completed during the year, 62. Certificated, 57.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Asiana*	T20, G1	24.6.16	273	13½	6,465	4·67	302·28	250	344½
Violet III.	T15, G3	30.9.16	273	8	5,786	4·60	266·03	250	303¼
Britannia	T31, G1	1.10.16	†251	15	7,845	3·90	306·12	250	349
Persica	T11, G1	1.10.16	273	18	‡6,014	5·02	301·76	250	344
Serbia	T41, G1	6.10.16	273	19	8,841	4·32	382·03	250	435½
Mongolia	T20, G2	11.10.16	273	12½	7,704	4·18	322·15	250	367¼
Netherlana	T34, G1	11.10.16	273	26	10,373	3·89	403·69	250	460¼
Russia	T43, G1	17.10.16	273	10	6,580	4·00	263·47	200	300¼
Bullion	T2, G1	19.10.16	235	4	7,892	4·22	333·30	250	380
Malaysia	T24, G2	14.11.16	273	12	6,182	4·54	280·83	250	320¼
Lallah	T11, G2	6.12.16	273	23	6,809	4·56	310·72	175	354¼
Coinage	T2, G2	12.12.16	273	24½	7,125	4·02	286·57	175	326¾
Tabeltina	T17A, G3	13.12.16	273	20½	6,822	3·99	272·37	175	310½
Sylph	T4, G3	14.12.16	273	18½	6,684	4·53	302·69	175	345
Santa Clara	T6, G2	15.12.16	273	30	8,488	4·53	381·61	200	438½
Azora	T26, G2	16.12.16	273	18	6,298	4·06	255·71	175	291½
Pacifiea	T36, G1	18.12.16	273	8	6,253	4·46	279·06	250	318
Gallipoli	T45, G1	20.12.16	273	15½	7,262	4·11	298·74	250	340½
Birdseye	T15, G4	23.12.16	273	18	7,596	5·16	392·07	250	447
Argentina	T19A, G1	25.12.16	†263	19	7,716	3·75	289·55	250	330
Samotina	T15A, G3	31.12.16	273	20	6,350	4·82	306·30	175	349¼
Empire	T15, G4	10.1.17	273	12½	5,180	4·77	247·15	200	281¾
Aleutia	T35, G1	18.1.17	273	19½	7,033	4·35	306·08	250	349
Briar	T16A, G3	31.12.16	273	13½	5,779	4·40	254·44	175	290
Opticia	T15D, G1	30.1.17	273	22	7,914	4·32	341·88	175	389¾
Aridia	T29, G2	5.2.17	273	9½	6,345	4·32	274·44	200	312¾
Sumonta	T15A, G2	16.2.17	273	22	6,725	4·22	284·25	175	324
Cutty	T16, G2	24.2.17	273	21½	8,351	4·64	388·18	200	442½
Tropic	T28, G2	5.3.17	273	10½	5,717	4·35	‡248·91	175	283¾
Congo	T23, G3	20.3.17	273	17½	6,103	4·19	255·74	250	291½
Baltica	T39, G1	4.4.17	273	22½	8,512	4·31	366·95	250	418¼
Anglia	T31, G2	20.4.17	273	20	6,790	3·79	267·66	175	305¼
Lily	T46, G1	24.4.17	273	19½	7,651	4·10	313·46	250	357¼
Kubanka	T6, G2	3.5.17	273	23	7,223	4·27	308·65	175	351¾
Avesia	T15C, G1	6.5.17	273	26½	8,231	4·06	334·51	200	381¼
Laranaga§	T7, G2	16.4.17	257	16	4,780	4·15	198·63	175	226½
Africana	T23, G2	8.5.17	273	11½	5,622	4·74	266·76	250	304
Soudana	T23, G2	16.5.17	273	18	7,113	4·16	296·39	250	338
Orinoco	T47, G1	22.5.17	273	10	5,823	4·26	248·20	175	283
Nictitana||	T15, G5	24.5.17	221	4	3,587	5·04	181·31	175	206¾
Nickahoe	T15, G4	26.5.17	273	14	5,807	4·32	250·79	175	286
Muria¶	T5, G1	6.5.17	266	4	7,293	5·57	406·10	250	463
Morocco	T23A, G2	7.6.17	273	22½	8,421	3·65	307·35	175	350¼
Latakia	T12, G2	11.6.17	273	26	7,421	4·72	350·56	200	399¾
Hollandia	T34, G2	16.6.17	273	14½	5,447	4·53	247·04	200	281½
Iris	T46, G2	1.7.17	273	18½	6,402	4·62	296·28	175	337¾
Sylvia	T4, G2	4.7.17	273	16	7,424	4·77	354·25	250	403¾
Silken Bond	T16, G3	5.7.17	273	5	4,382	4·48	196·63	175	224¼
Jamaica	T24, G4	13.7.17	273	20½	6,417	4·00	256·99	175	293
Velveteen (imp.)	T50, G1	5.8.17	273	15	8,593	3·52	303·06	250	345½
La Reina	T15, G5	5.8.17	273	15½	7,410	4·67	346·39	250	394¾
Tonga	T37, G2	15.8.17	273	12½	8,290	4·21	349·04	250	398
Tasmania	T32, G1	16.8.17	273	10½	7,853	4·09	320·90	250	365
India	T10, G1	16.8.17	273	17	7,990	4·08	326·35	250	372
Coinage	T2, G2	15.9.17	273	16½	5,698	4·23	241·17	200	275
Nyanza	T23B, G1	18.9.17	273	20½	6,025	4·24	256·01	175	291¾
Mongolia..	T20, G2	23.9.17	273	22	8,642	4·44	384·09	250	437¾

* By an oversight this cow was omitted from last year's Annual Report.

† Sold before term expired.

‡ Sickness for eleven days affected yield.

§ Entry had to be deferred sixteen days through sickness after calving.

|| Calved three months prematurely.

¶ Entry delayed through attack of milk fever.

MRS. A. BLACK, Noorat. (Jersey.)

Completed during the year, 12. Certificated, 12.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Grey Girl	2064	4.4.17	273	8½	4,859	5·63	272·25	250	310¼
Marguerite	3576	8.4.17	255	4	6,292	4·87	306·39	250	349¼
Beauty of Candelo II. ..	3739	10.4.17	273	11	6,585	4·46	294·15	250	335¼
Flashlight	1972	19.4.17	253	4	6,221	4·77	296·95	250	338¼
Heatherbell *	3574	21.4.17	273	12½	7,029	4·42	310·61	250	354
Sheila V...	3580	26.4.17	273	6½	4,686	5·40	253·06	250	288½
Carnation V.	3572	26.4.17	246	4	4,767	5·62	268·08	250	305½
Mona's Pearl	3577	7.5.17	273	6	6,611	5·07	335·57	250	382½
Madge	3575	19.5.17	251	4	5,903	5·45	321·75	250	366¾
Opaline	3578	4.7.17	273	8	5,025	5·16	259·12	250	296½
Dolly of Clydebank II. ..	3742	18.7.17	273	6½	5,182	6·37	329·89	250	376
Diamond III.	Not yet allotted	3.9.17	221	4	3,430	5·78	198·17	175	226

C. FALKENBERG, Elliminyt. (Jersey.)

Completed during the year, 6. Certificated, 5.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Annie of Taringa	4023	29.5.17	273	8½	4,803	5·65	271·18	250	309¼
Handsome Lassie of Colac ..	4028	26.6.17	262	4	5,289	4·71	249·52	200	284½
Canary of Colac	Not yet allotted	7.7.17	273	6	3,812	5·24	200·29	175	228½
Doris II. of Kingsvale ..	4025	16.8.17	273	12½	5,183	5·40	280·03	250	319¼
Princess of Colac	Not yet allotted	24.9.17	273	10½	3,983	5·25	209·10	200	238½

GEELONG HARBOR TRUST, Marshalltown. (Ayrshire.)

Completed during the year, 15. Certificated 8.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Princess Edith of "Gowrie Park"	2876	25.9.16	273	11¼	6,060	4·26	258·43	250	294½
Belle of Sparrovale ..	Not yet allotted	25.9.16	273	10½	4,353	4·32	175·51	175	200
Flower of Sparrovale ..	,,	18.10.16	273	12½	4,581	4·44	203·22	175	231¾
Madge of Sparrovale ..	,,	12.12.16	273	16	5,343	3·88	207·48	175	236½
Maid of Sparrovale ..	,,	9.7.17	273	23	8,142	4·09	332·88	200	379½
Flora of Sparrovale ..	,,	6.9.17	273	5	4,057	5·01	203·38	175	231¾
Clover of Sparrovale ..	2872	9.9.17	273	10½	6,894	4·97	342·86	200	390¾
Laura of Sparrovale ..	Not yet allotted	22.9.17	273	10½	4,754	5·03	239·13	175	272½

* Published in first quarterly report as "Bluebell of Sparrowvale" prior to name being changed.

MRS. A. C. GIBBS, Bamawn. (Jersey.)

Completed during the year, 6. Certificated, 6.

Name of Cow	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Boronia of Springhurst ..	4377	23.5.17	254	4	4,558	5·54	252·56	250	288
Musk of Springhurst ..	4388	29.5.17	273	10	4,482	5·77	258·61	250	294¾
Hyacinth of Springhurst ..	3705	30.5.17	273	10	4,974	6·30	313·17	250	357
Honeysuckle of Springhurst	4383	26.6.17	261	4	4,319	5·88	253·91	250	289½
Rose of Springhurst ..	4393	5.7.17	253	4	3,836	6·08	233·13	200	265¾
Foxglove of Springhurst ..	3704	22.7.17	273	18	6,749	5·81	392·04	250	445

W. C. GREAVES, Monomeith. (Ayrshire.)

Completed during the year, 7. Certificated, 7.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Grace Darling of Warrook ..	2909	5.10.16	259	4	7,306	4·40	321·63	250	366¾
Vanity of Warrook ..	2546	6.10.16	273	12	8,2[illegible]1	4·64	382·26	250	435¾
Bit of Fashion	1852	23.12.16	273	16	6,447	5·00	322·58	250	367¾
Grace II. of Warrook ..	2908	3.4.17	273	15	6,669	4·93	328·87	250	375
Future of Warrook ..	2244	25.4.17	273	20½	8,885	4·02	357·18	250	407¼
Letty of Warrook ..	Not yet allotted	17.9.17	273	9	6,670	4·38	292·35	200	333¼
Fuchsia of Warrook ..	2544	20.9.17	273	16	8,807	4·16	366·14	250	417½

T. HARVEY, Boisdale. (Jersey.)

Completed during the year, 4. Certificated, 4.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Lady Marge V.	Not yet allotted	3.4.17	273	14	4,868	5·80	282·61	175	322¼
Kirsty V.	4100	17.6.17	273	18½	6,211	5·58	346·40	200	395
Sparkle	2978	21.6.17	273	17½	5,875	5·35	314·18	250	358¼
Dainty VI.	4099	30.7.17	273	10	9,189	5·14	472·87	250	539

HILL and DOAKE, Narracan. (Jersey.)

Completed during the year, 3. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Cloverleaf	Not yet allotted	29.5.17	270	4	4,441	4·41	197·24	175	224¾
Cream Girl	329, C.S.J.H.B.	22.7.17	273	6	4,347	5·09	221·55	200	252½

A. JACKSON, Glen Forbes. (Jersey and Ayrshire.)

Jersey—Completed during the year, 5. Certificated, 5.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Graceful Duchess XI. ..	394 C.S.J.H.B.	21.9.16	273	14	5,751	6·43	369·58	250	421¼
Mystery XIV. of Melrose ..	452 C.S.J.H.B.	21.9.16	273	15	6,784	5·19	351·94	250	401¼
Lady's Maitland ..	423 C.S.J.H.B.	11.2.17	273	17	5,521	5·60	309·27	175	352½
Maitland's Duchess of Lesterfield	177 C.S.J.H.B.	15.8.17	273	15½	6,816	5·18	353·12	200	402½
Mystery XIV.'s Beauty ..	Not yet allotted	6.9.17	273	13	4,690	5·42	254·34	175	290

Ayrshire—Completed during the year, 2. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
Princess Mary II. of Strachan	Not yet allotted	10.10.16	273	13½	7,153	3·94	282·09	250	321½

A. W. JONES, Geelong. (Jersey and Friesian.)

Jersey—Completed during the year, 9. Certificated, 9.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Silver Queen II. of Colac ..	4032	27.11.16	273	23½	6,318	6·76	427·18	250	487
Lady Gray I. of St. Albans ..	4186	20.4.17	273	14	5,899	6·85	404·05	250	460½
Lady Grey VIII.	4187	5.6.17	273	26	9,430	4·87	459·31	250	523½
Lady Grey V.	3756	20.7.17	273	22	8,084	5·37	434·49	250	495½
Buttercup	875	6.8.17	273	11	6,318	4·00	253·24	250	288½
Blanchette I. of St. Albans ..	Not yet allotted	21.8.17	273	21½	7,101	5·13	364·86	200	416
Queenie II. of Holmwood ..	,,	27.8.17	273	21½	7,659	5·53	423·88	250	483¼
Jubilee XV.	,,	10.9.17	273	25	9,361	5·33	499·55	250	569½
Bright Jewel	,,	23.9.17	273	16	6,009	6·06	364·40	250	415½

Friesian—Completed during the year, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
May Queen II.	Not yet allotted	20.7.17	273	30	9.386	4·37	410·39	175	467¾

G. KENT, Junr., Archie's Creek. (Ayrshire.)

Completed during the year, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Bud of View Point ..	2163	15.7.17	273	16½	7,497	4·87	365·39	250	416½

C. G. KNIGHT, Cobram. (Jersey.)

Completed during the year, 18. Certificated, 18.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Royal Rose	2585	28.9.16	273	9	5,952	5·80	345·35	250	393¾
Princess of Tarnpirr ..	2986	15.10.16	273	9	6,234	4·97	310·08	250	353½
Patchwork	Not yet allotted	18.11.16	273	13	4,264	5·64	240·53	175	274¼
Princess May	,,	28.11.16	273	19	4,285	5·36	229·62	175	261¾
Idyll's Morocco	4207	30.11.16	273	16½	5,147	6·04	310·97	200	354½
Dolly of Tarnpirr	1840	3.12.16	273	24½	5,812	5·47	318·17	250	362¾
Christmas of Tarnpirr ..	4206	17.12.16	273	17½	4,328	6·16	266·63	200	304
My Queen of Tarnpirr ..	4209	27.4.17	273	17½	5,775	5·82	335·94	200	383
Mistletoe of Tarnpirr ..	2984	6.5.17	273	25½	7,630	5·13	391·49	250	446¼
Romany Lass	2563	15.6.17	273	22	6,543	5.54	362·72	250	413½
Sweetheart II. of Tarnpirr ..	4211	6.6.17	273	20½	5,669	5·31	301·35	200	343½
Arcadia	1534	17.8.17	273	25	9,450	5·07	479·16	250	546¼
Foxglove of Tarnpirr ..	2983	6.9.17	273	19½	6,819	5·97	407·23	250	464¼
Mythic	2404	12.9.17	273	20½	9,060	5·23	474·15	250	540½
Alice of Tarnpirr	4205	17.9.17	273	15½	6,868	5·96	409·56	250	466¾
Primrose of Tarnpirr ..	2985	20.9.17	273	15	6,145	5·83	358·48	250	408½
Lily of Tarnpirr	2221	21.9.17	273	23½	9,252	4·66	431·40	250	491¾
Bonnie	2980	23.9.17	273	21	7,474	5·41	404·61	250	461¼

LEACH BROS., Binginwarri. (Jersey.)

Completed during the year, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Ida May	404 C.S.J.H.B.	8.9.17	273	26	6,939	5·07	352·14	175	401½

HIGH SCHOOL, Leongatha. (Jersey).

Completed during the year, 3. Certificated, 3.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Mona	155 C.S.J.H.B.	12.8.17	273	22	10,344	4·65	480·95	250	548¼
The Gift	259 C.S.J.H.B.	14.8.17	273	19½	6,933	4·95	343·50	250	391½
First Choice	372 C.S.J.H.B.	21.8.17	273	13	6,820	5·98	407·85	200	465

C. D. LLOYD, Caulfield. (Jersey.)

Completed during the year, 7. Certificated, 7.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Countess Twylish	928	2.11.16	273	14	7,617	4·54	346·01	250	394½
Spatter	4242	24.12.16	*184	8½	2,599	7·30	189·71	175	216¼
Whitebread	4244	11.3.17	273	24	6,786	5·40	366·61	175	418
Dainty Molly	2830	15.3.17	273	19	5,293	6·05	320·33	250	365
Sweetbread XXIV. (imp.) ..	2979	14.8.17	273	17	8,372	4·82	403·61	250	460
Creamcake	Not yet allotted	20.8.17	273	16	5,278	6·17	325·80	175	371½
Gingerbread	,,	1.9.17	273	14½	5,339	5·78	308·87	175	352

* Sold before completion of term.

MEIER BROS., Box Hill. (Jersey.)

Completed during the year, 2. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Princess Lady II.	Not yet allotted	21.8.17	273	14	3,896	4·83	188·08	175	214½
Flower Queen	4285	10.9.17	273	19	6,480	5·17	335·23	200	382¼

MUHLEBACH BROS., Batesford. (Ayrshire.)

Completed during the year, 5. Certificated, 4.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Lily of Retreat	2961	16.11.16	273	7½	4,600	4·63	213·18	175	243
Fuchsia of Retreat ..	2960	7.9.17	273	5½	5,408	4·35	235·10	200	268
Boronia of Retreat ..	4321	12.9.17	273	11	5,534	4·30	237·98	175	271¼
Pansy of Retreat	4336	21.9.17	273	7	4,275	4·73	202·34	175	230½

MRS. ORCHARD, Grahamvale, Shepparton. (Jersey.)

Completed during the year, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Ivy	Not yet allotted	23.9.17	273	4½	4,586	4·59	210·39	200	239¾

C. GORDON LYON, Heidelberg. (Jersey.)

Completed during the year, 36. Certificated, 36.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Tambourine	1417	7.10.16	273	20	7,902	4·98	394·08	250	449¼
Molly II...	614	20.10.16	273	12	7,532	4·90	369·05	250	420¾
Pride of Rocklands ..	Not yet allotted	13.11.16	273	21	7,112	5·21	370·46	250	422¼
Thora II.	,,	13.11.16	273	14½	5,086	5·87	298·56	175	340¼
Symphony	,,	23.11.16	273	11½	4,760	6·56	312·20	200	356
Thora III.	,,	8.12.16	273	20	5,785	6·07	351·06	175	400¼
Magnet's Lass III. ..	,,	12.12.16	273	15½	5,766	6·05	349·19	175	398
Molly V. . ..	,,	13.12.16	273	13½	5,342	5·63	300·95	175	343
Audrey Lassie	825	17.12.16	273	19½	7,808	4·55	355·73	250	405½
Ettie IV.	2889	28.12.16	273	28½	9,813	4·34	426·17	250	485¾
Lassie II.	1136	31.12.16	273	19½	7,539	4·78	360·92	250	411½
Statuette . ..	4251	8.1.17	273	20½	6,816	5·76	392·62	250	447½
Lassie	509	18.1.17	273	11½	5,356	5·17	276·85	250	315½
Silvermine XIV.	Not yet allotted	5.2.17	273	21½	6,067	4·95	300·14	175	342¼
Starfinch II. . ..	2915	7.3.17	273	11½	5,473	4·95	271·25	250	309¼
Noble Jessie	2843	14.3.17	273	11½	5,575	5·67	316·59	250	361
Hawthorn IV.	Not yet allotted	27.3.17	273	13½	4,998	6·10	304·90	175	347½
Chorus	2823	31.3.17	273	17	7,309	5·62	411·35	250	469
Hawthorn V. of Banyule ..	Not yet allotted	6.4.17	273	14½	5,247	5.46	286·37	175	326½
Hawthorn of Banyule ..	1064	8.4.17	273	13	6,920	5·21	360·66	250	411¼
Noble's Pet	4247	14.4.17	273	16	5,847	5·36	313·61	175	357½
Soprano	1395	28.4.17	273	17	7,874	5·88	463·86	250	528¾
Pretty May (imp.) ..	3103	3.5.17	273	12½	6,024	5·38	323·97	250	369¼
Milkmaid 37th	1222	14.6.17	273	21½	8,639	4·77	412·55	250	470¼
Velveteen II.	2927	15.6.17	273	27	10,434	4·67	487·73	250	556
May IX. of Banyule ..	Not yet allotted	22.6.17	273	16½	5,251	5·00	262·81	175	299½
May X. of Banyule ..	,,	22.6.17	273	13½	4,527	4·94	223·57	175	254¾
Harp	,,	12.7.17	273	14½	5,114	5·83	298·34	175	340
Zenobia	,,	20.7.17	273	7½	3,363	5·88	197·71	175	225½
Captor's Vanilla	3330	22.7.17	273	18	7,368	4·65	343·02	250	391
Maitland's Petal II. ..	Not yet allotted	31.7.17	273	8½	5,013	6·51	326·50	200	372¼
Melodious	2336	1.8.17	273	8	7,666	4·98	380·91	250	434¼
Zoe V.	1497	5.8.17	273	11	6,920	5·47	378·79	250	431¾
Cora	3331	15.8.17	261	4	5,348	5·92	317·07	250	361½
Captor's Thora	3329	4.9.17	273	15	7,398	5·46	404·09	250	460¾
Parrakeet	3625	19.9.17	273	18	8,656	3·88	335·81	250	382¾

W. PARBURY, Warburton. (Jersey.)

Completed during the year, 1. Certificated, 1.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Sweet Alice	532 C.S.J.H.B.	11.9.17	273	10	4,327	6·35	274·89	250	313½

T. MESLEY, Dalyston. (Jersey.)

Completed during the year, 17. Certificated, 17.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Lily Langtry	Not yet allotted	7.1.17	273	15½	5,391	5·91	318·69	250	363¼
Nanette	,,	4.2.17	273	11	4,658	4.95	230·40	200	262¾
Daisy of Springhurst ..	1788	19.4.17	273	12	6,300	5·54	348·08	250	396¾
Euroa of Springhurst ..	1918	12.5.17	258	4	4,920	5·52	271·41	250	309½
La Charme	Not yet allotted	9.6.17	273	20¼	5,577	5·01	279·52	200	318¾
Meadow Sweet II. ..	,,	3.7.17	273	20½	7,574	5·27	399·42	250	455
Bright Princess	,,	7.7.17	273	19	7,838	5·24	411·06	250	468½
Fairy Belle	,,	8.7.17	273	15½	6,035	5·93	357·95	250	408
Alsyke of Springhurst ..	1515	22.7.17	273	16	6,376	4·98	318·01	250	362½
Charmian	Not yet allotted	23.7.17	273	13	6,824	5·54	378·63	250	431½
Namesake II.	,,	3.8.17	273	19½	7,248	4·92	356·88	250	407
Little Queen	,,	4.8.17	273	15	7,087	5·16	366·15	250	417½
Verbena	,,	8.8.17	273	15	5,889	5·22	307·43	200	350½
Gazelle	,,	9.8.17	273	21	7,373	4·70	346·57	250	390
Phyllis	,,	13.8.17	273	16	6,201	5·49	340·72	200	388½
Charmian II.	,,	19.8.17	273	17	5,888	5·18	305·40	200	348¼
Garenne II.	,,	27.8.17	273	14	6,681	5.26	351.76	200	401

J. D. READ, Springhurst. (Jersey.)

Completed during the year, 23. Certificated, 23.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Nightshade of Springhurst ..	3707	22.3.17	273	25	8,477	4·93	418·51	250	477
Bauksia of Springhurst ..	Not yet allotted	31.3.17	273	9½	5,115	5·59	308·32	175	351½
Infanta of Springhurst ..	,,	21.4.17	273	9	4,946	5·69	281·24	175	320½
Trefoil of Springhurst ..	4395	22.4.17	273	16	7,139	5·97	426·48	200	486¼
Princess Defiance of Springhurst	4392	23.4.17	273	20½	7,223	5·75	415·17	250	473¼
Buttercup of Springhurst ..	3702	28.4.17	273	14½	6,442	6·16	397·14	250	452¾
Princess of Springhurst ..	2521	29.4.17	273	16½	7,010	5·63	394·99	250	450¼
Verbena of Springhurst ..	Not yet allotted	2.5.17	273	13	5,545	5·40	299·31	175	341¼
Crocus of Springhurst ..	,,	10.5.17	273	15	6,295	5·56	349·92	175	399
Tulip of Springhurst ..	2730	11.5.17	273	12½	6,426	5·42	348·47	250	397¼
Wattle of Springhurst ..	Not yet allotted	13.5.17	273	16	5,768	4·98	287·37	175	327½
Holly of Springhurst ..	,,	24.5.17	273	14½	5,061	5·48	277·27	175	316
Solanum of Springhurst ..	4394	29.5.17	273	8½	7,465	4·89	364·89	200	416
Cobea of Springhurst ..	4379	13.6.17	273	7	5,512	5·60	308·56	200	351¾
Lobelia of Springhurst ..	4386	15.6.17	273	6	4,940	5·78	285·80	200	325¾
Freezia of Springhurst ..	4382	18.6.17	273	12	6,797	5·51	374·25	200	426¾
Daffodil of Springhurst ..	4381	2.7.17	273	8½	4,431	6·36	282·04	200	321½
Czarina of Springhurst ..	4380	8.7.17	273	5	6,692	5·72	383·17	200	423
Arum of Springhurst ..	4375	9.7.17	265	4	6,519	5·56	363·08	250	414
Primrose of Springhurst ..	4391	17.7.17	273	9	6,869	5·18	356·30	250	406¼
Lucerne of Springhurst ..	Not yet allotted	18.7.17	273	11	5,050	6·04	305·10	175	347¾
Balsam of Springhurst ..	4376	19.6.17	*246	14½	7,517	5·61	422·32	250	481½
Calla of Springhurst ..	4378	29.7.17	273	9	5,951	5·03	299·20	200	341

* Withdrawn from test 27 days prematurely in error.

MISS S. L. ROBINSON, Malvern. (Jersey.)

Completed during the year, 5. Certificated, 2.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Twinkle	538 C.S.J.H.B.	5.3.17	273	20	5,468	4·92	269·49	250	307¼
Needle X. of Puen Buen..	Not yet allotted	1.8.17	273	11½	4,303	5·72	248·64	175	283½

GEO. ROWE, Kardella. (Jersey.)

Completed during the year, 7. Certificated, 6.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Ruby	513 C.S.J.H.B.	9.11.16	273	7	5,798	4·82	279·55	250	318¾
Bluebell of Brighteyes ..	562 C.S.J.H.B.	12.11.16	273	4	2,929	6·22	182·21	175	207¾
Princess Dot	497 C.S.J.H.B.	19.12.16	273	7½	3,485	5·12	178·40	175	203¼
Daffodil	157 C.S.J.H.B.	12.9.17	273	10	6,156	4·31	265·38	250	302½
Queen Elizabeth ..	Not yet allotted	12.9.17	273	8½	4,732	4·53	214·32	175	244¼
Rose F..	509 C.S.J.H.B.	17.9.17	273	9	6,324	4·04	256·00	250	291¾

A. H. SCHIER, Caldermeade. (Ayrshire.)

Completed during the year, 11. Certificated, 6.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Dot of Pine Grove ..	Not yet allotted	1.4.17	273	15½	7,721	4·53	349·59	250	398½
Dear of Midbranch ..	,,	2.5.17	273	14½	6,258	4·50	281·65	250	321
Streak of Balvormie ..	,,	31.7.17	273	9	6,573	4·21	276·83	250	315½
Silver of Inverleigh ..	,,	30.8.17	273	10	4,862	4·31	209·87	175	239¼
Mussel II. of Balvormie ..	,,	4.9.17	273	9	6,141	4·24	270·84	250	308¾
Betty II. of Pine Grove ..	4624	21.9.17	273	12	4,489	4·50	202·42	175	230¾

O. J. SYME, Macedon. (Friesian.)

Completed during the year, 3. Certificated, 3.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Bolobek Belle	Not yet allotted	1.7.17	273	29½	10,174	3·77	384·53	250	438½
Duplicate Posch Maud ..	,,	21.7.17	273	22½	10,762	3·63	390·74	250	145½
Bolobek Isabella	,,	23.8.17	273	21½	8,133	3·63	295·66	175	337

W. WOODMASON, Malvern. (Jersey.)

Completed during the year, 84. Certificated, 82.

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Lady Elector II. of Melrose ..	Not yet allotted	25.9.16	273	12½	5,524	6·51	359·69	200	410
Empire V. of Melrose ..	4515	28.9.16	273	12½	7,067	5·54	391·68	250	446½
Graceful Duchess XII. of Melrose	Not yet allotted	2.10.16	273	16	5,168	6·19	320·20	175	365
Handsome Girl VII. of Melrose	,,	4.10.16	273	13	5,665	7·12	403·18	200	459½
Sweet Pansy II. of Melrose ..	,,	4.10.16	273	6	4,440	5·90	261·94	200	298½
Lassie Fowler V. of Melrose ..	,,	8.10.16	273	14½	5,128	6·03	309·18	200	352½
Gaiety Girl VIII. of Melrose ..	,,	9.10.16	273	18½	6,563	5·99	393·20	200	448¼
Peerless 10th of Melrose ..	,,	11.10.16	273	14½	5,197	6·11	317·37	175	361¾
Peerless IX. of Melrose ..	,,	16.10.16	273	7	4,007	5·60	224·59	200	256
Jessie VI. of Melrose ..	4519	6.11.16	273	24½	7,691	6·74	518·35	250	591
Daisy VI. of Melrose ..	4512	9.11.16	273	9	6,018	5·26	318·15	250	362¾
Zoe V. of Melrose ..	1496	11.11.16	273	11	5,803	6·24	361·94	250	412½
Lady Elector 3rd of Melrose ..	Not yet allotted	19.11.16	273	9	4,098	6·53	267·59	175	305
Jessie V. of Melrose ..	3652	20.11.16	273	15	6,279	5·12	321·30	250	366¼
Mystery 15th of Melrose ..	Not yet allotted	21.11.16	273	9½	3,740	5·75	215·05	175	245¼
Jessie's Progress	3657	22.11.16	273	19	5,916	6·23	368·84	250	420½
Pearl II. of Melrose ..	3670	22.11.16	273	17½	6,526	5·43	351·71	250	404¼
Graceful Duchess of Melrose VIII.	1056	25.11.16	273	25	7,786	5·70	443·76	250	506
Lily 6th of Melrose ..	Not yet allotted	28.11.16	273	15	4,693	6·69	314·10	175	358
Peerless VI. of Melrose ..	3671	28.11.16	273	10	5,816	5·68	330·22	250	376½
Chevy 8th of Melrose ..	4511	2.12.16	273	23	6,853	6·01	412·06	250	469¾
Pearl 4th of Melrose ..	Not yet allotted	6.12.16	273	12	4,886	6·06	296·28	175	337¾
Flower VI. of Melrose ..	3641	7.12.16	273	22½	6,867	5·50	377·94	250	430¾
Quality VI. of Melrose ..	3674	7.12.16	273	26	8,494	5·31	451·29	250	514½
Chevy VI. of Melrose ..	3635	7.12.16	273	13½	7,440	4·59	341·27	250	389
Rarity VIII. of Melrose ..	Not yet allotted	9.12.16	273	14	5,999	5·90	353·79	175	403¼
Jessie X. of Melrose ..	3655	16.12.16	273	11½	5,480	5·61	307·39	250	350½
Mystery XII. of Melrose ..	3667	17.12.16	273	17½	6,122	5·17	316·61	250	361
Jenny Lind VI. of Melrose ..	3649	30.12.16	273	13½	6,112	4·73	289·16	250	329¾
Flower IX. of Melrose ..	Not yet allotted	31.12.16	273	15½	3,668	5·48	201·15	175	229¼
Pearl V. of Melrose ..	,,	31.12.16	273	14	4,126	5·68	234·41	175	267¼
Rarity VI. of Melrose ..	3675	1.1.17	273	21½	8,839	5·10	450·57	250	513¾
Pleasance V. of Melrose ..	4527	4.1.17	273	10½	4,914	5·54	272·51	250	310¾

W. WOODMASON, Malvern—*continued.*

Name of Cow.	Herd Book No.	Date of Calving.	No. of Days in Test.	Weight of Milk last Day of Test.	Weight of Milk.	Average Test.	Butter Fat.	Standard Required.	Estimated Weight of Butter.
				lbs.	lbs.		lbs.	lbs.	lbs.
Mates V. of Melrose ..	4524	5.1.17	273	22	6,652	5·26	350·25	250	399¼
Fuchsia X. of Melrose ..	4516	12.1.17	273	16½	7,473	4·66	348·31	250	397
Edith V. of Melrose* ..	4514	16.1.17	273	14½	5,466	5·15	281·64	250	321
Jessie XVI. of Melrose ..	Not yet allotted	19.1.17	273	13½	4,207	6·83	287·54	175	327¾
Peerless of Melrose III. ..	2817	1.3.17	273	11½	5,566	5·20	289·59	250	320¼
Mystery XVI. of Melrose ..	Not yet allotted	5.3.17	273	12	3,807	5·98	227·98	175	259¾
Graceful Duchess XIV. of Melrose	,,	31.3.17	273	13½	4,473	6·26	280·12	175	319¼
Jessie IX. of Melrose ..	3654	5.4.17	273	19	7,159	5·50	393·91	250	449
Empire VI. of Melrose ..	Not yet allotted	6.4.17	273	20	7,058	6·25	440·80	200	502½
Blossom IV. of Melrose ..	,,	16.4.17	273	14	6,506	5·38	350·05	200	399
Mermaid III. of Melrose† ..	4525	4.5.17	273	14	6,683	4·83	323·07	250	368¼
Vanilla IX. of Melrose ..	Not yet allotted	14.5.17	273	15	4,532	5·39	244·28	175	278½
Laura VI. of Melrose ..	3658	20.5.17	273	9½	5,527	5·30	292·69	250	333¾
Snowy III. of Melrose ..	3676	22.5.17	273	22	8,512	4·52	385·04	250	439
Mates VI. of Melrose ..	Not yet allotted	29.5.17	273	20½	7,190	5·43	390·32	175	445
Mystery VIII. of Melrose ..	3664	31.5.17	273	13	6,036	5·90	355·98	250	405¾
Pearl III. of Melrose ..	4526	4.6.17	273	14½	6,434	6·65	427·78	250	487¾
Fuchsia XI. of Melrose ..	Not yet allotted	12.6.17	273	16	5,869	5·45	319·68	200	364½
Mayflower VI. of Melrose ..	,,	16.6.17	273	13½	5,259	6·01	316·30	200	360½
Empire IV. of Melrose ..	3639	20.6.17	273	18½	7,731	5·22	403·53	250	460
Jessie XV. of Melrose ..	Not yet allotted	29.6.17	273	11½	5,229	6·21	325·76	200	371½
Waverley Lass II. of Melrose	,,	1.7.17	273	14½	6,096	6·36	387·75	200	442
Jessie XII. of Melrose ..	4520	12.7.17	273	18½	7,270	6·19	450·24	250	513¼
Lassie Fowler III. of Melrose	1137	16.7.17	273	15	8,072	5·13	414·52	250	472½
Jenny Lind IX. of Melrose	Not yet allotted	21.7.17	273	18	6,141	6·39	391·50	200	446¼
Laura IX. of Melrose ..	,,	25.7.17	273	15½	6,105	6·42	392·36	200	447¼
Jessie XIV. of Melrose ..	,,	26.7.17	273	16	5,886	5·90	347·37	200	396
Gaiety Girl IX. of Melrose ..	,,	28.7.17	273	14	5,015	6·59	330·86	200	377¼
Quality VII. of Melrose ..	,,	1.8.17	273	16	4,584	5·23	239·73	175	273¼
Jessie XIX. of Melrose ..	,,	2.8.17	273	12	3,785	5·97	226·10	175	257¾
Jessie XVII. of Melrose ..	,,	2.8.17	273	11	4,046	7·01	283·86	175	323½
Peerless XI. of Melrose ..	,,	11.8.17	273	15	4,987	5·38	268·61	175	307¼
Graceful Duchess X. of Melrose	3646	11.8.17	273	17	6,952	6·32	439·62	250	501¼
Vanilla VII. of Melrose ..	Not yet allotted	20.8.17	273	18	6,991	6·01	420·30	200	479¼
Vanilla V. of Melrose ..	3678	21.8.17	273	12	8,010	4·56	366·54	250	417¾
Rarity IX. of Melrose ..	Not yet allotted	23.8.17	273	14	5,182	5·41	280·51	175	319¾
Graceful Duchess XI. of Melrose	4518	23.8.17	273	17	7,555	6·21	469·04	250	534¾
Waverley Lass III. of Melrose	Not yet allotted	21.8.17	273	9½	4,113	6·55	269·43	175	307¼
Jessie XVIII. of Melrose ..	,,	28.8.17	273	11½	5,200	5·83	303·18	175	345½
Graceful Duchess XV. of Melrose	,,	28.8.17	273	13½	5,146	6·48	333·95	175	380¾
Lassie Fowler IV. of Melrose	4522	29.8.17	273	21	8,505	5·52	469·81	250	535½
Sweet Pansy III. of Melrose	Not yet allotted	30.8.17	273	15	5,987	6·49	388·89	200	443¼
Jessie XIII. of Melrose ..	4520	11.9.17	273	15½	7,420	6·29	467·22	250	532½
Peerless VIII. of Melrose ..	3673	13.9.17	273	16½	8,088	5·13	414·92	250	473
Graceful Duchess XII. of Melrose	Not yet allotted	16.9.17	273	14	5,622	6·32	355·83	200	405½
Jessie XI. of Melrose ..	3656	18.9.17	273	11½	6,065	6·09	368·99	250	420½
Polly II. of Melrose ..	4528	21.9.17	273	18½	6,732	5·88	396·05	250	451½
Fuchsia XII. of Melrose ..	Not yet allotted	22.9.17	273	17	5,752	5·09	292·01	175	333
Empire V. of Melrose ..	4515	25.9.17	273	17½	8,379	5·43	456·23	250	520

* For her two previous lactation periods this cow's name appeared as "Edith II.," through no fault of this Department.

† For her three previous lactation periods this cow's name appeared as "Mermaid II. of Melrose," through no fault of this Department.

COWS IN ORDER OF MERIT.

Cows over 4 years of Age or on third lactation period—250 lbs. Standard.

Order of Merit.	Name of Cow.	Herd Book No.	Owner.	Breed.	Milk.	Average Test.	Butter Fat.	Butter.
					lbs.		lbs.	lbs.
1	Jessie VI. of Melrose ..	4519	W. Woodmason..	Jersey ..	7,691	6·74	518·35	591
2	Jubilee XV.	..	A. W. Jones ..	,, ..	9.361	5·33	499·55	569½
3	Velveteen II.	2927	C. G. Lyon ..	,, ..	10,434	4·67	487·73	556
4	Mona	155 C.S.J.H.B.	Leongatha High School	,, ..	10,344	4·65	480·95	548¼
5	Arcadia	1534	C. G. Knight ..	,, ..	9,450	5·07	479·16	546¼
6	Mythic	2401	C. G. Knight ..	,, ..	9,060	5·23	474·15	540½
7	Dainty VI.	4099	T. Harvey ..	,, ..	9,189	5·14	472·87	539
8	Lassie Fowler IV. of Melrose	4522	W. Woodmason	,, ..	8,505	5·52	469·81	535½
9	Graceful Duchess XI. of Melrose	4518	W. Woodmason	,, ..	7,555	6·21	469·04	531¼
10	Jessie XIII. of Melrose ..	4520	W. Woodmason	,, ..	7,420	6·29	467·22	532½
11	Soprano	1395	C. G. Lyon ..	,, ..	7,874	5·88	463·86	528¾
12	Lady Grey VIII. ..	4187	A. W. Jones ..	,, ..	9,430	4·87	459·31	523½
13	Empire V. of Melrose ..	1515	W. Woodmason	,, ..	8,379	5·43	456·23	520
14	Quality VI. of Melrose ..	3674	W. Woodmason	,, ..	8,494	5·31	451·29	514½
15	Rarity VI. of Melrose ..	3675	W. Woodmason	,, ..	8,839	5·10	450·57	513¾
16	Jessie XII. of Melrose ..	4520	W. Woodmason	,, ..	7,270	6·19	450·24	513¼
17	Graceful Duchess VIII. of Melrose	1056	W. Woodmason	,, ..	7,786	5·70	443·76	506
18	Graceful Duchess X. of Melrose	3646	W. Woodmason	,, ..	6,952	6·32	439·62	501¼
19	Lady Grey V.	3756	A. W. Jones ..	,, ..	8,084	5·37	434·49	495½
20	Lily of Tarnpirr ..	2221	C. G. Knight ..	,, ..	9,252	4·66	431·40	491¾
21	Pearl III. of Melrose ..	4526	W. Woodmason	,, ..	6,434	6·65	427·78	487¾
22	Silver Queen of Colac ..	4032	A. W. Jones ..	,, ..	6,318	6·76	427·18	487
23	Ettie IV.	2889	C. G. Lyon ..	,, ..	9,813	4·34	426·17	485¾
24	Queenie II. of Holmwood	..	A. W. Jones ..	,, ..	7,659	5·53	423·88	483¼
25	Balsam of Springhurst* ..	4376	J. D. Read ..	,, ..	7,517	5·61	422·32	481½
26	Nightshade of Springhurst	3707	J. D. Read ..	,, ..	8,477	4·93	418·51	477
27	Princess Defiance of Springhurst	4392	J. D. Read ..	,, ..	7,223	5·75	415·17	473¼
28	Peerless VIII. of Melrose	3673	W. Woodmason..	,, ..	8,088	5·13	414·92	473
29	Lassie Fowler III. of Melrose	1137	W. Woodmason..	,, ..	8,072	5·13	414·52	472½
30	Milkmaid 37th ..	1222	C. G. Lyon ..	,, ..	8,639	4·77	412·55	470¼
31	Chevy VIII. of Melrose	4511	W. Woodmason	,, ..	6,853	6·01	412·06	469¾
32	Chorus	2823	C. G. Lyon ..	,, ..	7,309	5·62	411·35	469
33	Bright Princess ..	..	T. Mesley ..	,, ..	7,838	5·24	411·06	468½
34	Alice of Tarnpirr ..	4205	C. G. Knight ..	,, ..	6,868	5·96	409·56	466¾
35	Foxglove of Tarnpirr ..	2983	C. G. Knight ..	,, ..	6,819	5·97	407·23	464¼
36	Muria	T5, G1	Department of Agriculture	Red Poll	7,293	5·57	406·10	463
37	Bonnie	2980	C. G. Knight ..	Jersey ..	7,474	5·41	404·61	461¼
38	Captor's Thora ..	3329	C. G. Lyon ..	,, ..	7,398	5·46	404·09	460¾
39	Lady Grey I. of St. Albans	4186	A. W. Jones ..	,, ..	5,899	6·85	404·05	460½
40	Netherlana	T34, G1	Department of Agriculture	Red Poll	10,373	3·89	403·69	460¼
41	Sweetbread XXIV. ..	2979	C. D. Lloyd ..	Jersey ..	8,372	4·82	403·61	460
42	Empire IV. of Melrose ..	3639	W. Woodmason	,, ..	7,731	5·22	403·53	460
43	Meadow Sweet II. ..	..	T. Mesley ..	,, ..	7,574	5·27	399·42	455
44	Buttercup of Springhurst	3702	J. D. Read ..	,, ..	6,442	6·16	397·14	452¾
45	Polly II. of Melrose ..	4528	W. Woodmason	,, ..	6,732	5·88	396·05	451½
46	Princess of Springhurst ..	2521	J. D. Read ..	,, ..	7,010	5·63	394·99	450¼
47	Tambourine	1417	C. G. Lyon ..	,, ..	7,902	4·98	394·08	449¼
48	Jessie IX. of Melrose ..	3654	W. Woodmason	,, ..	7,159	5·50	393·91	449
49	Statuette	4251	C. G. Lyon ..	,, ..	6,816	5·76	392·62	447½
50	Birdseye	T15, G4	Department of Agriculture	Red Poll	7,596	5·16	392·07	447
51	Foxglove of Springhurst ..	3704	Mrs. A. Gibbs ..	Jersey ..	6,749	5·81	392·04	445
52	Empire V. of Melrose ..	4515	W. Woodmason	,, ..	7,067	5·54	391·68	446½
53	Mistletoe of Tarnpirr ..	2984	C. G. Knight ..	,, ..	7,630	5·13	391·49	446¼
54	Duplicate Posch Maud ..	..	O. J. Syme ..	Friesian	10,762	3·63	390·74	445½
55	Snowy III. of Melrose ..	3676	W. Woodmason	Jersey..	8,512	4·52	385·04	439
56	Bolobek Belle	..	O. J. Syme ..	Friesian	10,174	3·77	384·53	438½
57	Mongolia	T20, G2	Department of Agriculture	Red Poll	8,642	4·44	384·09	437¾
58	Vanity of Warrook ..	2546	W. C. Greaves ..	Ayrshire	8,241	4·64	382·26	435¾
59	Serbia	T41, G1	Department of Agriculture	Red Poll	8,841	4·32	382·03	435½
60	Melodious	2336	C. G. Lyon ..	Jersey ..	7.666	4·98	380·91	434¼

* Incomplete test.

Cows over 4 Years of Age or on Third Lactation Period—250 lbs. Standard—*continued.*

Order of Merit.	Name of Cow.	Herd Book No.	Owner.	Breed.	Milk.	Average Test.	Butter Fat.	Butter.
					lbs.		lbs.	lbs.
61	Zoe V.	1497	C. G. Lyon	Jersey	6,920	5·47	378·79	431¾
62	Charmian	..	T. Mesley	,,	6,824	5·54	378·63	431½
63	Flower VI. of Melrose	3641	W. Woodmason	,,	6,867	5·50	377·94	430¾
64	Bluebell II.	..	F. Bidgood	,,	5,869	6·38	374·49	427
65	Pride of Rocklands	..	C. G. Lyon	,,	7,112	5·21	370·46	422¼
66	Graceful Duchess XI.	391 C.S.J.H.B.	A. Jackson	,,	5,751	6·43	369·58	421¼
67	Molly II.	614	C. G. Lyon	,,	7,532	4·90	369·05	420¾
68	Jessie XI. of Melrose	3656	W. Woodmason	,,	6,065	6·09	368·99	420½
69	Jessie's Progress	3657	W. Woodmason	,,	5,916	6·23	368·84	420½
70	Baltica	T39, G1	Department of Agriculture	Red Poll	8,512	4·31	366·95	418¼
71	Vanilla V. of Melrose	3678	W. Woodmason	Jersey	8,040	4·56	366·54	417¾
72	Little Queen	..	T. Mesley	,,	7,087	5·16	366·15	417½
73	Fuchsia of Warook	2544	W. C. Greaves	Ayrshire	8,807	4·16	366·14	417½
74	Bud of View Point	2163	Geo. Kent	,,	7,497	4·87	365·39	416½
75	Bright Jewel	..	A. W. Jones	Jersey	6,009	6·06	364·40	415½
76	Arum of Springhurst	4375	J. D. Read	,,	6,519	5·56	363·08	414
77	Romany Lass	2563	C. G. Knight	,,	6,543	5·54	362·72	413½
78	Zoe V. of Melrose	1496	W. Woodmason	,,	5,803	6·24	361·94	412½
79	Karong Belle	..	J. Baker	Red Poll	6,682	5·41	361·62	412¼
80	Lassie II.	1136	C. G. Lyon	Jersey	7,539	4·78	360·92	411½
81	Hawthorn of Banyule	1064	C. G. Lyon	,,	6,920	5·21	360·66	411¼
82	Primrose of Tarnpirr	2985	C. G. Knight	,,	6,145	5·83	358·48	408½
83	Fairy Belle	..	T. Mesley	,,	6,035	5·93	357·95	408
84	Future of Warrook	2244	W. C. Greaves	Ayrshire	8,885	4·02	357·18	407¼
85	Namesake II.	..	T. Mesley	Jersey	7,248	4·92	356·88	407
86	Primrose of Springhurst	4391	J. D. Read	,,	6,869	5·18	356·30	406¼
87	Mystery VIII. of Melrose	3664	W. Woodmason	,,	6,036	5·90	355·98	405¾
88	Audrey Lassie	825	C. G. Lyon	,,	7,808	4·55	355·73	405½
89	Pearl II. of Melrose	3670	W. Woodmason	,,	6,526	5·43	354·71	404¼
90	Sylvia	T4, G2	Department of Agriculture	Red Poll	7,424	4·77	354·25	403¾
91	Mystery XIV. of Melrose	452 C.S.J.H.B.	A. Jackson	Jersey	6,784	5·19	351·94	401¼
92	Mates V. of Melrose	4524	W. Woodmason	,,	6,652	5·26	350·25	399¼
93	Dot of Pine Grove	..	A. H. Schier	Ayrshire	7,721	4·53	349·59	398½
94	Tonga	T37, G2	Department of Agriculture	Red Poll	8,290	4·21	349·04	398
95	Tulip of Springhurst	2730	J. D. Read	Jersey	6,426	5·42	348·47	397¼
96	Fuchsia X. of Melrose	4516	W. Woodmason	,,	7,473	4·66	348·31	397
97	Daisy of Springhurst	1788	T. Mesley	,,	6,300	5·54	348·08	396¾
98	Gazelle	..	T. Mesley	,,	7,373	4·70	346·57	395
99	La Reina	T15, G5	Department of Agriculture	Red Poll	7,410	4·67	346·39	394¾
100	Countess Twylish	928	C. D. Lloyd	Jersey	7,617	4·54	346·01	394½
101	Royal Rose	2585	C. G. Knight	,,	5,952	5·80	345·35	393¾
102	The Gift	259 C.S.J.H.B.	Leongatha High School	,,	6,933	4·95	343·50	391½
103	Captor's Vanilla	3330	C. G. Lyon	,,	7,368	4·65	343·02	391
104	Chevy VI. of Melrose	3635	W. Woodmason	,,	7,440	4·59	341·27	389
105	Elcho Lady	..	J. Baker	Red Poll	7,028	4·84	340·11	387¾
106	Parrakeet	3625	C. G. Lyon	Jersey	8,656	3·88	335·81	382¾
107	Mona's Pearl	3577	Mrs. A. Black	,,	6,611	5·07	335·57	382½
108	Bullion	T2, G1	Department of Agriculture	Red Poll	7,892	4·22	333·30	380
109	Peerless VI. of Melrose	3671	W. Woodmason	Jersey	5,816	5·68	330·22	376½
110	Dolly of Clydebank II.	3742	Mrs. A. Black	,,	5,182	6·37	329·89	376
111	Grace II. of Warrook	2908	W. C. Greaves	Ayrshire	6,669	4·93	328·87	375
112	India	T10, G1	Department of Agriculture	Red Poll	7,990	4·08	326·35	372
113	Pretty May (imp.)	3103	C. G. Lyon	Jersey	6,024	5·38	323·97	369¼
114	Mermaid III. of Melrose	4525	W. Woodmason	,,	6,683	4·83	323·07	368¼
115	Bit of Fashion	1852	W. C. Greaves	Ayrshire	6,447	5·00	322·58	367¾
116	Mongolia	T20, G2	Department of Agriculture	Red Poll	7,704	4·18	322·15	367¼
117	Madge	3575	Mrs. A. Black	Jersey	5,903	5·45	321·75	366¾
118	Grace Darling of Warrook	2909	W. C. Greaves	Ayrshire	7,306	4·40	321·63	366¾
119	Jessie V. of Melrose	3652	W. Woodmason	Jersey	6,279	5·12	321·30	366¼
120	Tasmania	T32, G1	Department of Agriculture	Red Poll	7,853	4·09	320·90	365
121	Dainty Molly	2830	C. D. Lloyd	Jersey	5,293	6·05	320·33	365
122	Lily Langtry	..	T. Mesley	,,	5,391	5·91	318·69	363¼

Cows over 4 Years of Age or on Third Lactation Period—250 lbs. Standard—*continued.*

Order of Merit.	Name of Cow.	Herd Book No.	Owner.	Breed.	Milk.	Average Test.	Butter Fat.	Butter.
					lbs.		lbs.	lbs.
123	Dolly of Tarnpirr ..	1840	C. G. Knight ..	Jersey ..	5,812	5·47	318·17	362¾
124	Daisy VI. of Melrose ..	..	W. Woodmason	,, ..	6,048	5·26	318·15	362¾
125	Alsyke of Springhurst ..	1515	T. Mesley ..	,, ..	6,376	4·98	318·01	362½
126	Cora	3331	C. G. Lyon ..	,, ..	5,348	5·92	317·07	361½
127	Mystery XII. of Melrose	3667	W. Woodmason	,, ..	6,122	5·17	316·61	361
128	Noble Jessie	2843	C. G. Lyon ..	,, ..	5,575	5·67	316·59	361
129	Sparkle	2978	T. Harvey ..	,, ..	5,875	5·35	314·18	358¼
130	Lily	T46, G1	Department of Agriculture	Red Poll	7,651	4·10	313·46	357¼
131	Hyacinth of Springhurst	3705	Mrs. A. Gibbs ..	Jersey ..	4,974	6·30	313·17	357
132	Heatherbell	3574	Mrs. A. Black ..	,, ..	7,029	4·12	310·61	354
133	Princess of Tarnpirr ..	2986	C. G. Knight ..	,, ..	6,234	4·97	310·08	353½
134	Jessie X. of Melrose ..	3655	W. Woodmason	,, ..	5,480	5·61	307·39	350½
135	Marguerite	3576	Mrs. A. Black ..	,, ..	6,292	4·87	306·39	349¼
136	Britannia*	T31, G1	Department of Agriculture	Red Poll	7,845	3·90	306·12	349
137	Aleutia	T35, G1	Department of Agriculture	,,	7,033	4·35	306·08	349
138	Velveteen (imp.) ..	T50, G1	Department of Agriculture	,,	8,593	3·52	303·06	345½
139	Asiana	T20, G1	Department of Agriculture	,,	6,465	4·67	302·28	344½
140	Persica	T11, G1	Department of Agriculture	,,	6,014	5·02	301 76	344
141	Gallipoli	T45, G1	Department of Agriculture	,,	7,262	4·11	298·74	340½
142	Flashlight	1972	Mrs. A. Black ..	Jersey	6,221	4·77	296·95	338½
143	Soudana	T23, G2	Department of Agriculture	Red Poll	7,113	4·16	296·39	338
144	Beauty of Candelo II. ..	3739	Mrs. A. Black ..	Jersey ..	6,585	4·46	294·15	335¼
145	Laura VI. of Melrose ..	3658	W. Woodmason	,, ..	5,527	5·30	292·69	333¾
146	Peerless of Melrose III.	2817	W. Woodmason	,, ..	5,566	5·20	289·59	330¼
147	Argentina*	T19A, G1	Department of Agriculture	Red Poll	7,716	3·75	289·55	330
148	Jenny Lind VI. of Melrose	3649	W. Woodmason	Jersey ..	6,112	4·73	289·16	329¾
149	Elcho Maid	..	J. Baker ..	Red Poll	5,510	5·13	282·51	322
150	Princess Mary II. of Strahan	..	A. Jackson ..	Ayrshire	7,153	3·94	282·09	321½
151	Dear of Midbranch ..	..	A. H. Schier ..	,,	6,258	4·50	281·65	321
152	Edith V. of Melrose ..	4514	W. Woodmason	Jersey ..	5,466	5·15	281·64	321
153	Malaysia	T24, G2	Department of Agriculture	Red Poll	6,182	4·54	280·83	320¼
154	Doris II. of Kingsvale ..	4025	C. Falkenberg ..	Jersey ..	5,183	5·40	280·03	319¼
155	Ruby	513 C.S.J.H.B.	G. Rowe ..	,, ..	5,798	4·82	279·55	318¾
156	Pacifica	T36, G1	Department of Agriculture	Red Poll	6,253	4·46	279·06	318
157	Lassie	509	C. G. Lyon ..	Jersey ..	5,356	5·17	276·85	315½
158	Streak of Balvormie ..	..	A. H. Schier ..	Ayrshire	6,573	4·21	276·83	315½
159	Sweet Alice	532 C.S.J.H.B.	W. Parbury ..	Jersey ..	4,327	6·35	274·89	313½
160	Pleasance V. of Melrose..	4527	W. Woodmason	,, ..	4,914	5·54	272·51	310¾
161	Grey Girl	2064	Mrs. A. Black ..	,, ..	4,859	5·63	272·25	310¼
162	Euroa of Springhurst ..	1918	T. Mesley ..	,, ..	4,920	5·52	271·41	309½
163	Starfinch II.	2915	C. G. Lyon ..	,, ..	5,473	4·95	271·25	309¼
164	Annie of Taringa ..	4023	C. Falkenberg ..	,, ..	4,803	5·65	271·18	309¼
165	Mussel II. of Balvormie	..	A. H. Schier ..	Ayrshire	6,141	4·24	270·84	308¾
166	Twinkle	538 C.S.J.H.B.	Miss Robinson ..	Jersey ..	5,468	4·92	269·49	307¼
167	Carnation V.	3572	Mrs. A. Black ..	,, ..	4,767	5·62	268·08	305½
168	Africana	T23, G2	Department of Agriculture	Red Poll	5,622	4·74	266·76	304
169	Violet III.	T15, G3	Department of Agriculture	,,	5,786	4·60	266·03	303¼
170	Daffodil	157 C.S.J.H.B.	G. Rowe ..	Jersey ..	6,156	4·31	265·38	302½
171	Opaline	3578	Mrs. A. Black ..	,, ..	5,025	5·16	259·12	296½
172	Musk of Springhurst ..	4388	Mrs. A. Gibbs ..	,, ..	4,482	5·77	258·61	294¾
173	Princess Edith of Gowrie Park	2876	Geelong Harbor Trust	Ayrshire	6,060	4·26	258·43	294½
174	Rose	509 C.S.J.H.B.	G. Rowe ..	Jersey ..	6,324	4·04	256·00	291¾

* Incomplete test.

Cows over 4 Years of Age or on Third Lactation Period—250 lbs. Standard—*continued.*

Order of Merit.	Name of Cow.	Herd Book No.	Owner.	Breed.	Milk.	Average Test.	Butter Fat.	Butter.
					lbs.		lbs.	lbs.
175	Congo	T23, G3	Department of Agriculture	Red Poll	6,103	4·19	255·74	291½
176	Honeysuckle of Springhurst	4,383	Mrs. A. Gibbs ..	Jersey ..	4,319	5·88	253·91	289½
177	Buttercup	875	A. W. Jones ..	,, ..	6,318	4·00	253·24	288½
178	Sheila V.	3580	Mrs. A. Black ..	,, ..	4,686	5·40	253·06	288½
179	Boronia of Springhurst ..	4377	Mrs. A. Gibbs ..	,, ..	4,558	5·54	252·56	288

Cows under 4 Years of Age—200 lbs. Standard.

Order of Merit.	Name of Cow.	Herd Book No.	Owner.	Breed	Milk.	Average Test.	Butter Fat.	Butter.
					lbs.		lbs.	lbs.
1	Empire VI. of Melrose ..	..	W. Woodmason	Jersey ..	7,058	6·25	440·80	502½
2	Trefoil of Springhurst ..	4395	J. D. Read ..	,, ..	7,139	5·97	426·48	486¼
3	Vanilla VII. of Melrose	..	W. Woodmason	,, ..	6,991	6·01	420·30	479¼
4	First Choice	372 C.S.J.H.B.	Leongatha High School	,, ..	6,820	5·98	407·85	465
5	Handsome Girl VII. of Melrose	..	W. Woodmason	,, ..	5,665	7·12	403·18	459½
6	Gaiety Girl VIII. of Melrose	..	W. Woodmason	,, ..	6,563	5·99	393·20	448¼
7	Laura IX. of Melrose ..	..	W. Woodmason	,, ..	6,105	6·42	392·36	447¼
8	Jenny Lind IX. of Melrose	..	W. Woodmason	,, ..	6,141	6·39	391·50	446¼
9	Sweet Pansy III. of Melrose	..	W. Woodmason	,, ..	5,987	6·49	388·89	443¼
10	Cutty..	T16, G2	Department of Agriculture	Red Poll	8,351	4·64	388·18	442½
11	Waverley Lass II. of Melrose	..	W. Woodmason	Jersey ..	6,096	6·36	387·75	442
12	Santa Clara	T6, G2	Department of Agriculture	Red Poll	8,488	4·53	384·61	438½
13	Czarina of Springhurst	4380	J. D. Read ..	Jersey ..	6,692	5·72	383·17	423
14	Freezia of Springhurst ..	4382	J. D. Read ..	,, ..	6,797	5·51	374·25	426¾
15	Solanum of Springhurst..	4394	J. D. Read ..	,, ..	7,465	4·89	364·89	416
16	Blanchette I. of St. Albans	..	A. W. Jones ..	,, ..	7,101	5·13	364·86	416
17	Lady Elector II. of Melrose	..	W. Woodmason	,, ..	5,524	6·51	359·69	410
18	Graceful Duchess XII. of Melrose	..	W. Woodmason	,, ..	5,622	6·32	355·83	405½
19	Maitland's Duchess of Lesterfield	177 C.S.J.H.B.	A. Jackson ..	,, ..	6,816	5·18	353·12	402½
20	Garenne II.	..	T. Mesley ..	,, ..	6,681	5·26	351·76	401
21	Latakia	T12, G2	Department of Agriculture	Red Poll	7.421	4·72	350·56	399¾
22	Blossom IV. of Melrose ..	..	W. Woodmason	Jersey ..	6,506	5·38	350·05	399
23	Jessie XIV. of Melrose ..	..	W. Woodmason	,, ..	5,886	5·90	347·37	396
24	Kirsty V.	4100	T. Harvey ..	,, ..	6,211	5·58	346·40	395
25	Clover of Sparrovale ..	2872	Geelong Harbor Trust	Ayrshire	6,894	4·97	342·86	390¾
26	Phyllis	..	T. Mesley ..	Jersey ..	6,204	5·49	340·72	388½
27	My Queen of Tarnpirr ..	4209	C. G. Knight ..	,, ..	5,775	5·82	335·94	383
28	Flower Queen	4285	Meier Bros. ..	,, ..	6,480	5·17	335·23	382¼
29	Avesia	T15c, G1	Department of Agriculture	Red Poll	8,231	4·06	334·51	381¼
30	Maid of Sparrovale ..	..	Geelong Harbor Trust	Ayrshire	8,142	4·09	332·88	379½
31	Gaiety Girl IX. of Melrose	..	W. Woodmason	Jersey ..	5,015	6·59	330·86	377¼
32	Maitland's Petal II. ..	..	C. G. Lyon ..	,, ..	5,013	6·51	326·50	372¼
33	Jessie XV. of Melrose ..	..	W. Woodmason	,, ..	5,229	6·21	325·76	371½
34	Fuchsia XI. of Melrose ..	..	W. Woodmason	,, ..	5,869	5·45	319·68	364½
35	Mayflower VI. of Melrose	..	W. Woodmason	,, ..	5.259	6·01	316·30	360
36	Symphony	..	C. G. Lyon ..	,, ..	4,760	6·56	312·20	356
37	Idyll's Morocco ..	4207	C. G. Knight ..	,, ..	5,147	6·0[illegible]	310·97	354½
38	Lassie Fowler V. of Melrose	..	W. Woodmason	,, ..	5,128	6·03	309·18	352½
39	Cobea of Springhurst ..	4379	J. D. Read ..	,, ..	5,512	5·60	308·56	351¾
40	Verbena	..	T. Mes ey ..	,, ..	5,889	5·22	307·43	350½

Cows under 4 Years of Age—200 lbs. Standard—*continued.*

Order of Merit.	Name of Cow.	Herd Book No.	Owner.	Breed.	Milk.	Average Test.	Butter Fat.	Butter.
					lbs.		lbs.	lbs.
41	Charmian II.	..	T. Mesley ..	Jersey ..	5,888	5·18	305·40	348¼
42	Sweetheart II. of Tarnpirr	4211	C. G. Knight ..	,, ..	5,669	5·31	301·35	343½
43	Calla of Springhurst ..	4378	J. D. Read ..	,, ..	5,951	5·03	299·20	341
44	Letty of Warrook ..	..	W. C. Greaves ..	Ayrshire	6,670	4·38	292·35	333¼
45	Lobelia of Springhurst ..	4386	J. D. Read ..	Jersey ..	4,940	5·78	285·80	325¾
46	Daffodil of Springhurst ..	4381	J. D. Read ..	,, ..	4,431	6·36	282·04	321½
47	La Charm	..	T. Mesley ..	,, ..	5,577	5·01	279·52	318¾
48	Aridia	T29, G2	Department of Agriculture	Red Poll	6,345	4·32	274·44	312¾
49	Christmas	1206	C. G. Knight ..	Jersey ..	4,328	6·16	266·63	304
50	Russia	T43, G1	Department of Agriculture	Red Poll	6,580	4·00	263·47	300¼
51	Sweet Pansy II. of Melrose	..	W. Woodmason	Jersey ..	4,440	5·90	261·94	298½
52	Handsome Lassie of Colac	1028	C. Falkenberg ..	,, ..	5,289	4·71	249·52	284½
53	Empire	T15, G4	Department of Agriculture	Red Poll	5,180	4·77	247·15	281¾
54	Hollandia	T34, G2	Department of Agriculture	,,	5,447	4·53	247·04	281½
55	Coinage	T2, G2	Department of Agriculture	..	5,698	4·23	241·17	275
56	Fuchsia of Retreat ..	2960	Muhlebach Bros.	Ayrshire	5,408	4·35	235·10	268
57	Rose of Springhurst ..	4393	Mrs. A. Gibbs ..	Jersey ..	3,836	6·08	233·13	265¾
58	Nanette	Not yet allotted	T. Mesley ..	,, ..	4,658	4·95	230·40	262¾
59	Peerless IX. of Melrose ..	..	W. Woodmason	,, ..	4,007	5·60	224·59	256
60	Cream Girl	..	Hill and Doake	,, ..	4,347	5·09	221·55	252½
61	Ivy	..	Mrs. L. Orchard	,, ..	4,586	4·59	210·39	239¾
62	Princess of Colac ..	..	C. Falkenberg ..	,, ..	3,983	5·25	209·10	238½

Heifers—175 lbs. Standard.

Order of Merit.	Name of Cow.	Herd Book No.	Owner.	Breed.	Milk.	Average Test.	Butter Fat	Butter.
					lbs.		lbs.	lbs.
1	May Queen II. ..	..	A. W. Jones ..	Friesian	9,386	4·37	410·39	467¾
2	Mates VI. of Melrose ..	..	W. Woodmason	Jersey ..	7,190	5·43	390·32	445
3	Whitebread	4244	C. D. Lloyd ..	,, ..	6,786	5·40	366·61	418
4	Rarity VIII. of Melrose ..	..	W. Woodmason	.. ..	5,999	5·90	353·79	403¼
5	Ida May	404 C.S.J.H.B.	Leach Bros. ..	.. ..	6,939	5·07	352·14	401½
6	Thora III.	..	C. G. Lyon ..	.. ..	5,785	6·07	351·06	400¼
7	Crocus of Springhurst ..	..	J. D. Read ..	.. ..	6,295	5·56	349·92	399
8	Magnet's Lass III. ..	..	C. G. Lyon ..	.. ..	5,766	6·05	349·19	398
9	Opticia	T15D, G1	Department of Agriculture	Red Poll	7,914	4·32	341·88	389¾
10	Graceful Duchess XV. of Melrose	..	W. Woodmason	Jersey ..	5,146	6·48	333·95	380¾
11	Creamcake	5278	C. D. Lloyd ..	.. ..	5,278	6·17	325·80	371½
12	Graceful Duchess XII. of Melrose	..	W. Woodmason	.. ..	5,168	6·19	320·20	365
13	Peerless X. of Melrose ..	..	W. Woodmason	,, ..	5,197	6·11	317·37	361¾
14	Lily VI. of Melrose ..	..	W. Woodmason	.. ..	4,693	6·69	314·10	358
15	Noble's Pet	4247	C. G. Lyon ..	.. ..	5,847	5·36	313·61	357½
16	Lallah	T11, G2	Department of Agriculture	Red Poll	6,809	4·56	310·72	354¼
17	Lady's Maitland ..	423 C.S.J.H.B.	A. Jackson ..	Jersey ..	5,521	5·60	309·27	352½
18	Gingerbread	..	C. D. Lloyd ..	Jersey ..	5,339	5·78	308·87	352
19	Kubanka	T6, G2	Department of Agriculture	Red Poll	7,223	4·27	308·65	351¾
20	Banksia of Springhurst ..	..	J. D. Read ..	Jersey ..	5,115	5·59	308·32	351½
21	Morocco	T23A, G2	Department of Agriculture	Red Poll	8,421	3·65	307·35	350¼
22	Samotina	T15A, G3	Department of Agriculture	,, ..	6,350	4·82	306·30	349¼
23	Lucerne of Springhurst ..	..	J. D. Read ..	Jersey ..	5,050	6·04	305·10	347¾
24	Hawthorn IV. ..	..	C. G. Lyon ..	,, ..	4,998	6·10	304·90	347½
25	Jessie XVIII. of Melrose	..	W. Woodmason	,, ..	5,200	5·83	303·18	345½

HEIFERS—175 lbs. STANDARD—*continued.*

Order of Merit.	Name of Cow.	Herd Book No.	Owner.	Breed.	Milk.	Average Test.	Butter Fat.	Butter.
						lbs.	lbs.	lbs.
26	Sylph..	T4, G3	Department of Agriculture	Red Poll	6,684	4·53	302·69	345
27	Miss Twilight	..	F. Bidgood ..	Jersey ..	5,788	5·20	301·07	343¼
28	Molly V.	..	C. G. Lyon ..	,, ..	5,342	5·63	300·95	343
29	Silvermine XIV. ..	..	C. G. Lyon ..	,, ..	6,067	4·95	300·14	342¼
30	Verbena of Springhurst	..	J. D. Read ..	,, ..	5,545	5·40	299·31	341¼
31	Thora II.	..	C. G. Lyon ..	,, ..	5,086	5·87	298·56	340¼
32	Harp	..	C. G. Lyon ..	,, ..	5,114	5·83	298·34	340
33	Iris	T46, G2	Department of Agriculture	,, ..	6,402	4·62	296·28	337¾
34	Pearl IV. of Melrose ..	..	W. Woodmason	,, ..	4,886	6·06	296·28	337¾
35	Bolobek Isabella ..	..	O. J. Syme ..	Friesian	8,133	3·63	295·66	337
36	Fuchsia XII. of Melrose	..	W. Woodmason	Jersey ..	5,752	5·09	292·04	333
37	Jessie XVI. of Melrose ..	..	W. Woodmason	,, ..	4,207	6·83	287·54	327¾
38	Wattle of Springhurst ..	..	J. D. Read ..	,, ..	5,768	4·98	287·37	327½
39	Coinage	T2, G2	Department of Agriculture	Red Poll	7,125	4·02	286·57	326¾
40	Hawthorn V. of Banyule	..	C. G. Lyon ..	Jersey ..	5,247	5·46	286·37	326½
41	Sumonta	T15A, G2	Department of Agriculture	Red Poll	6,725	4·22	284·25	324
42	Jessie XVII. of Melrose..	..	W. Woodmason	Jersey ..	4,046	7·01	283·86	323½
43	Lady Marge V. ..	..	T. Harvey ..	,, ..	4,868	5·80	282·64	322¼
44	Infanta of Springhurst ..	..	J. D. Read ..	,, ..	4,946	5·69	281·24	320½
45	Rarity IX. of Melrose ..	..	W. Woodmason	,, ..	5,182	5·41	280·51	319¾
46	Graceful Duchess XIV. of Melrose	..	W. Woodmason	,, ..	4,473	6·26	280·12	319¼
47	Holly of Springhurst ..	..	J. D. Read ..	,, ..	5,061	5·48	277·27	316
48	Tabeltina	T17A, G3	Department of Agriculture	Red Poll	6,822	3·99	272·37	310½
49	Blanche Rose IX. ..	..	W. Atkinson ..	Shorthorn	6,774	4·01	271·53	309½
50	Waverley Lass III. of Melrose	..	W. Woodmason	Jersey ..	4,113	6·55	269·43	307¼
51	Peerless XI. of Melrose ..	..	W. Woodmason	,, ..	4,987	5·38	268·61	307¼
52	Anglia	T31, G2	Department of Agriculture	Red Poll	6,790	3·79	267·66	305¼
53	Lady Elector III. of Melrose	..	W. Woodmason	Jersey ..	4,098	6·53	267·59	305
54	May IX. of Banyule ..	..	C. G. Lyon ..	,, ..	5,251	5·00	262·81	299½
55	Jamaica	T24, G4	Department of Agriculture	Red Poll	6,417	4·00	256·99	293
56	Nyanza	T23B, G1	Department of Agriculture	,,	6,025	4·24	256·01	291¾
57	Azora	T26, G2	Department of Agriculture	,,	6,298	4·06	255·71	291½
58	Briar	T16A, G3	Department of Agriculture	,,	5,779	4·40	254·44	290
59	Mystery XIV.'s Beauty	..	A. Jackson ..	Jersey ..	4,690	5·42	254·34	290
60	Nickahoe	T15, G4	Department of Agriculture	Red Poll	5,807	4·32	250·79	286
61	Tropic	T28, G2	Department of Agriculture	,,	5,717	4·35	248·91	283¾
62	Needle X. of Puen Buen	..	Miss S. L. Robinson	Jersey ..	4,303	5·72	248·64	283½
63	Orinoco	T47, G1	Department of Agriculture	Red Poll	5,823	4·26	248·20	283
64	Vanilla IX. of Melrose ..	..	W. Woodmason	Jersey ..	4,532	5·39	244·28	278½
65	Patchwork	..	C. G. Knight ..	,, ..	4,264	5·64	240·53	274¼
66	Quality VII. of Melrose	..	W. Woodmason	,, ..	4,584	5·23	239·73	273¼
67	Laura of Sparrovale ..	..	Geelong Harbor Trust	Ayrshire	4,754	5·03	239·13	272½
68	Boronia of Retreat ..	4321	Muhlebach Bros.	,,	5,534	4·30	237·98	271¼
69	Pearl V. of Melrose ..	..	W. Woodmason	Jersey ..	4,126	5·68	234·41	267¼
70	Princess May	..	C. G. Knight ..	,, ..	4,285	5·36	229·62	261¾
71	Mystery XVI. of Melrose	..	W. Woodmason	,, ..	3,807	5·98	227·98	259¾
72	Jessie XIX. of Melrose ..	..	W. Woodmason	,, ..	3,785	5·97	226·10	257¾
73	May X. of Banyule ..	..	C. G. Lyon ..	,, ..	4,527	4·94	223·57	254¾
74	Poplar Vale Princess XXIX.	Not yet allotted	W. K. Atkinson	Shorthorn	5,595	3·92	219·56	250¼
75	Mystery XV. of Melrose	..	W. Woodmason	,, ..	3 740	5·75	215·05	245½
76	Queen Elizabeth ..	Not yet allotted	G. Rowe ..	Jersey ..	4,732	4·53	214·32	244¼
77	Lily of Retreat ..	2961	Muhlebach Bros.	Ayrshire	4,600	4·63	213·18	243
78	Silver of Inverleigh ..	..	A. H. Schier ..	,,	4,862	4·31	209·87	239¼
79	Madge of Sparrovale ..	..	Geelong Harbor Trust	,,	5,343	3·88	207·48	236½
80	Flora of Sparrovale ..	..	Geelong Harbor Trust	,,	4,057	5·01	203·38	231¾

HEIFERS—175 LBS. STANDARD—*continued.*

Order of Merit.	Name of Cow.	Herd Book No.	Owner.	Breed.	Milk.	Average Test.	Butter Fat.	Butter.
						lbs	lbs.	bs .
81	Flower of Sparrovale ..	..	Geelong Harbor Trust	,,	4,581	4·44	203·22	231¾
82	Betty II. of Pine Grove	4624	A. H. Schier ..	,,	4,489	4·50	202·42	230¾
83	Pansy of Retreat ..	4336	Muhlebach Bros.	Ayrshire	4,275	4·73	202·34	230½
84	Flower IX. of Melrose ..	..	W. Woodmason	Jersey ..	3,668	5·48	201·15	229¼
85	Canary of Colac ..	..	C. Falkenberg ..	,,	3,812	5·24	200·29	228½
86	Laranaga	T7, G2	Department of Agriculture	Red Poll	4,780	4·15	198·63	226½
87	Diamond III.	..	Mrs. A. Black ..	Jersey ..	3,430	5·78	198·17	226
88	Zenobia	..	C. G. Lyon ..	,, ..	3,363	5·88	197·71	225½
89	Cloverleaf	..	Hill and Drake	,, ..	4,441	4·41	197·24	224¾
90	Silken Bond	T16 G3	Department of Agriculture	Red Poll	4,382	4·48	196·63	224¼
91	Spatter*	4242	C. D. Lloyd ..	Jersey ..	2,599	7·30	189·71	216¼
92	Princess Lady II. ..	..	Meier Bros. ..	,, ..	3,896	4·83	188·08	214½
93	Bluebell of Brighteyes ..	562 C.S.J.H.B	G. Rowe ..	,, ..	2,929	6·22	182·21	207¾
94	Nietitana	T15, G5	Department of Agriculture	Red Poll	3,587	5·04	181·31	206¾
95	Princess Dot	497 C.S.J.H.B.	G. Rowe ..	Jersey ..	3 485	5·12	178·40	203¼
95	Bluebell of Sparrovale ..	..	Geelong Harbor Trust	Ayrshire	4,353	4·32	175·51	200

* Incomplete test.

HERD AVERAGES.

WM. WOODMASON'S "Melrose" Herd (Jerseys).

Cows of Herd in their Respective Classes.		Butter Fat.	Average.
		lbs.	
42 Mature Cows yielded		15,622·20	371·95
19 Second-calf Cows yielded	6,719·23 lbs.	..	353·64
Handicap of 50 lbs. each	950·00 lbs.		
		7,669·23	
23 Heifers yielded	6,447·59 lbs.	..	280·33
Handicap of 75 lbs. each	1,725·00 lbs.		
		8,172·59	
Return (without herd allowance)..		31,464·02	374·57
84 Cows in herd allowed 42 lbs. each (equal to ½ lb. per cow)		3,528·00	
Herd total (including all handicap allowances)		34,992·02	416·57

J. D. READ'S "Springhurst" Herd.

Cows of Herd in their Respective Classes.		Butter Fat.	Average.
		lbs.	
7 Mature Cows yielded		2 770·90	395·84
9 Second-calf Cows yielded	3,080·69 lbs.	..	342·29
Handicap of 50 lbs. each	450·00 lbs.		
		3,530·69	
7 Heifers yielded	2,108·53 lbs.	..	301·22
Handicap of 75 lbs. each	525·00 lbs.		
		2,633·53	
Return (without herd allowance)..		8,935·12	388·48
23 Cows in herd allowed 11½ lbs. each (equal to ½ lb. per cow)		264·50	
Herd total (including all handicap allowances)		9,199·62	399·98

C. GORDON LYON'S "Banyule" Herd (Jerseys).

Cows of Herd in their Respective Classes.		Butter Fat.	Average.
		lbs.	
22 Mature Cows yielded		8,153·53	370·61
2 Second-calf Cows yielded	638·70 lbs.	..	319·35
Handicap of 50 lbs. each	100·00 lbs.		
		738·70	
12 Heifers yielded	3,487·21 lbs.	..	290·60
Handicap of 75 lbs. each	900·00 lbs.		
		4,387·21	
Return (without herd allowance)..		13,279·44	368·87
36 Cows in herd allowed 18 lbs. each (equal to ½ lb. per cow)		648·00	
Herd total (including all handicap allowances)		13,927·44	386·87

C. G. KNIGHT'S "Tarnpirr," Herd (Jerseys).

Cows of Herd in their Respective Classes.		Butter Fat.	Average
		lbs.	
12 Mature Cows yielded		4,692·40	391·03
4 Second-calf Cows yielded	1,214·89 lbs.	..	303·72
Handicap of 50 lbs. each	200·00 lbs.		
		1,414·89	
2 Heifers yielded	469·97 lbs.	..	234·98
Handicap 75 lbs. each	150·00 lbs.		
		619·97	
Return (without herd allowance)..		6,727·26	373·73
18 Cows in herd allowed 9 lbs. each (equal to ½ lb. per cow)		162·00	
Herd total (including all handicap allowances)		6,889·26	382·73

THOS. MESLEY'S Herd (Jerseys).

Cows of Herd in their Respective Classes.		Butter Fat.	Average.
		lbs.	
12 Mature Cows yielded		4,152·37	346·03
4 Second-calt Cows yielded	1,305·31 lbs.	..	326·32
Handicap of 50 lbs. each	200·00 lbs.		
		1,505·31	
Nil Heifers			
Return (without herd allowance)..		5,657·68	353·60
16 Cows in herd allowed 8 lbs. each (equal to ½ lb. per cow)		128·00	
Herd total (including all handicap allowances)		5,785·68	361·60

DEPARTMENT OF AGRICULTURE RESEARCH FARM, WERRIBEE.

Cows of Herd in their Respective Classes.		Butter Fat.	Average.
		lbs.	
32 Mature Cows yielded		9,781·42	300·57
9 Second-calf Cows yielded	2,731·13 lbs.	..	303·46
Handicap of 50 lbs. each	450·00 lbs.		
		3,181·13	
21 Heifers yielded	5,632·34 lbs.	..	268·21
Handicap of 75 lbs. each	1,575·00 lbs.		
		7,207·34	
Return (without herd allowance)..		20,169·89	325·32
62 Cows in herd allowed 31 lbs. each (equal to ½ lb. per cow)		1 922·00	
Herd total (including all handicap allowances)		22,091·89	356·32

Mr. Gordon Lyon's Dairy Herd.

AGRICULTURE IN AMERICA.

Letter from Mr. A. E. V. Richardson, M.A., B.Sc., Agricultural Superintendent to the Director of Agriculture.

Agricultural Education of College Grade.

It seems to me that the agricultural work in the highest grade—the university and college—has been organized in America very thoroughly and completely.

Canada has followed the American plan of organization for the highest grade of instruction, so also has South Africa and the South American States.

The essential features in this organization are—

(1) Entrance requirements equivalent to four years' high school work; age eighteen.

(2) A four-years' course leading to the degree of B.S.A. or B.Sc.

(3) No manual work in the university course, but farm experience to be acquired during the long vacation on approved private farms. Practical and laboratory instruction is given in each technical subject throughout the entire course.

(4) This type of training is given for—

- (*a*) The teachers of agriculture in the high schools and elementary schools.
- (*b*) Agricultural specialists and extension workers.
- (*c*) Research workers in agriculture.
- (*d*) Farmers' sons. Half the graduates at the universities go straight back to the land. The farmers now are sending their sons to the colleges and universities in increasing numbers. Over 15,000 students attended the four-year course at the universities in 1916.

(5) The curriculum consists of four years of intensive study. An actual study of the curricula of 48 colleges of agriculture in the United States shows that the student's time during the four-years' course is taken up as follows:—

(1) Technical agricultural subjects—agronomy, animal husbandry, horticulture, dairying, farm management, &c.	42 %
(2) Pure and applied science—Agricultural chemistry, botany, physics, biology, &c. ..	38 %
(3) Non-technical and general subjects and foreign language—English, mathematics, civics, &c.	16 %
(4) Military training and physical training—required by law under the provision of the Agricultural Colleges Act	4 %

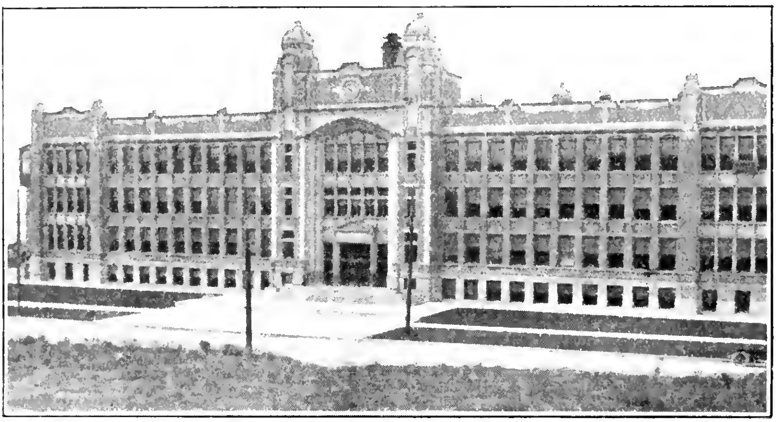
(6) The colleges train for leadership in agriculture and rural life.

Dr. Bailey, formerly Dean of the New York State College of Agriculture (Cornell University) says that the American ideal is to train rural citizens. He declares emphatically that you must break away

from the idea of trade schools for agriculture, and from the English ideal of agricultural education, which is founded on a social cast—that the farmer should be kept where he belongs. The Democracies of the world must see that social and economic conditions are attractive to men on the land. "The farmer's part in society," he said, "is not a mud-cell on which other ranges of activity are built, but it is a collateral, requiring equal education with other branches of human activity."

What America is doing for Agricultural Instruction of Secondary Grade.

Special agricultural schools, apart from the State colleges, are maintained wholly or in part by State funds in at least sixteen States. The schools vary in the nature of work, equipment, income, and size of district they serve. They are intended for boys of fourteen to eighteen years of age. The area served by the agricultural schools in the various States varies from a single county to an area serving a third of a State.



High School in Salt Lake City, Utah.

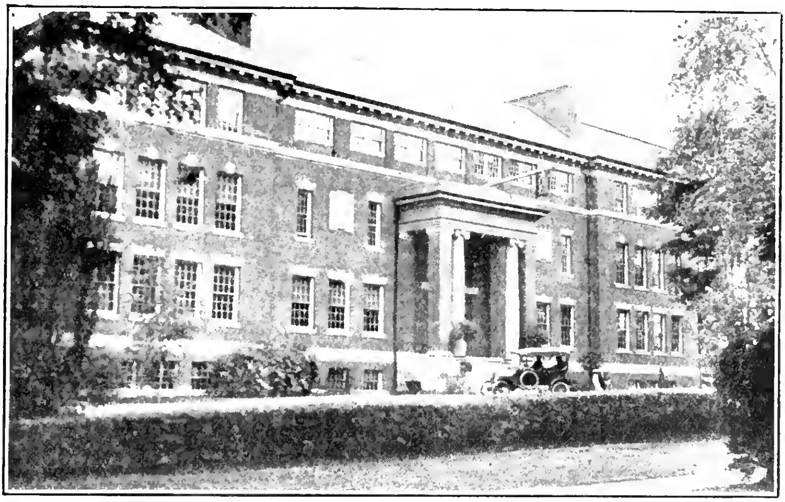
(Population of Salt Lake City, 113,000. Population of the State of Utah, 420,000.)

In Massachusetts, Michigan and Missouri, North Dakota, and Wisconsin, the county is the unit. In Alabama, there is an agricultural school in each of the nine Congressional districts. In California, Colorado, Minnesota, Nebraska, New York, Pennsylvania, and Vermont, there are agricultural schools serving large indeterminate areas

In addition to these special agricultural schools, many of the agricultural colleges maintain schools of agriculture. Thus at Colorado, Kansas, Iowa, Nebraska, Ohio, Minnesota agricultural colleges there are strong secondary schools of agriculture for boys of high school age, and for those who have been unable to reach the entrance requirements for the regular college courses.

Secondary agricultural teaching in the United States is in the melting pot. From what I have seen I have no doubt that an efficient and practical system of education will be evolved.

Many methods of teaching agriculture in the High School are in vogue in the United States, but probably the most promising of these methods is being tried out in Massachusetts. I propose to describe the system of agricultural instruction in Massachusetts as an illustration of the method adopted for secondary instruction in agriculture.



The Reading High School, Massachusetts.

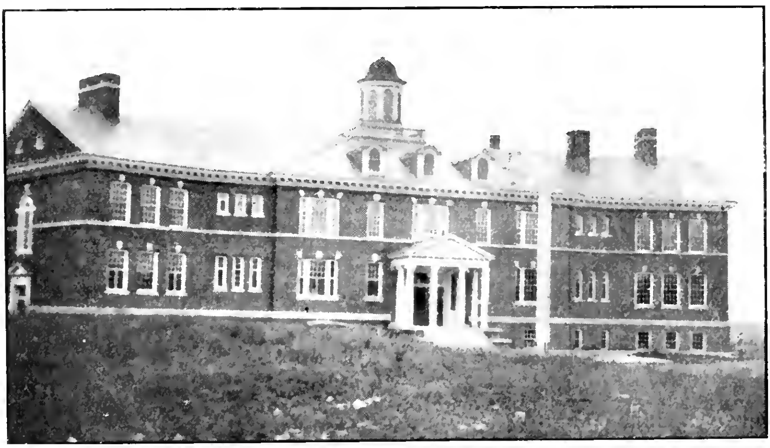
This High School gives an agricultural course based on the "Home Project" plan.

Agricultural Class Room in the Reading High School, Massachusetts.

Through the courtesy of the Massachusetts Board of Education I was able to inspect the Reading High School, the Bristol County Agricultural School, the Essex County Agricultural School, and the Norfolk County Agricultural High School. These schools provide for training in agriculture for boys of the age of fourteen to eighteen.

I did not, owing to the shortage of time, go to the Massachusetts Agricultural College. One cannot get the spirit and inside working of an agricultural college in less than three to five days' residence there, and I was anxious to see the secondary schools at work and compare them with our own agricultural high schools. I may say, however, that Massachusetts has one of the best colleges of agriculture in the East, and its standard of entrance is equal to Harvard University—"the Oxford of America." It has some 700 students going through the regular four-year course for a degree.

Massachusetts is quite a small State—about 5,000,000 acres—you could pack it away in the Western District of Victoria. It cannot be called an agricultural State, for the amount of produce it exports is unusually small. Its population of 4,000,000 is dependent on the West for its cereals, and for the large amount of fruit it imports. But it is a State in which intensive agriculture is practised; dairying, truck farming, and potato culture are the principal industries, but specialized



The Essex County Agricultural School, Massachusetts.

industries, such as fruit growing, onions, tobacco, asparagus, and cranberries have a firm hold. The distribution of these various types of agriculture is based on the market conditions, and on the adaptability of the soil. The fine sandy and silty soils of the Connecticut Valley are devoted to tobacco and onions and garden crops. The sandy bogs near Cape Cod are utilized for cranberries, whilst the dry sandy regions are used for asparagus culture. The clayey soils in the central portion of the State are adapted to hay and pasturage for dairy cows; the mountainous western portion is devoted to forest products.

Despite the fact that Massachusetts is not an agricultural State, it supports a college of agriculture with over 700 regular students and four special agricultural schools of secondary grade, and fourteen high schools with departments of agriculture within the high schools.

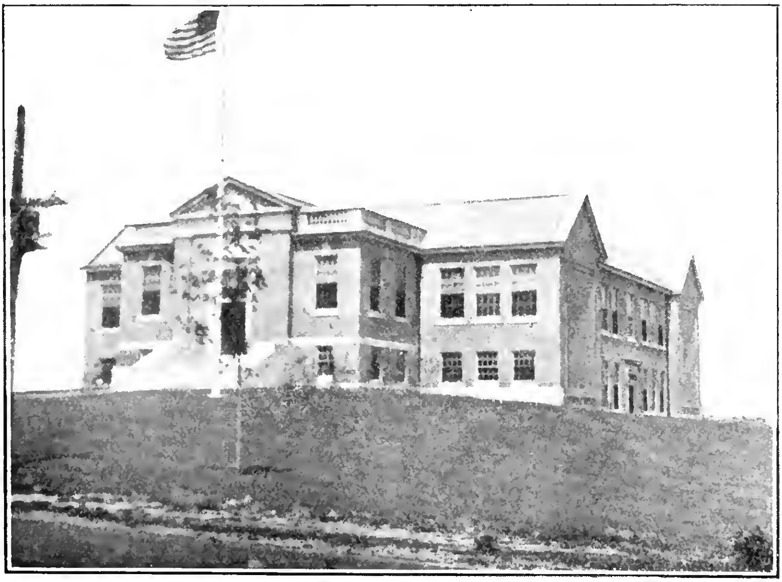
The equipment for these secondary schools and the cost of maintenance are supplied partly by the State and partly by the County or High School District. The State pays half, and the local people pay half,

and, in addition, raise the money for equipment and maintenance by local taxation.

There are two types of agricultural schools in Massachusetts—the special agricultural school and the high school with a department of agriculture. The special agricultural schools have attached to them farms on which the boys get instruction in farm practice. The average area of the farm is 100 acres.

The Home Project Principle.

The fourteen high schools with agricultural departments have no land attached to them. In both types of school the work centres round what are called "Home Projects," *i.e.*, productive projects thoroughly



The Norfolk County Agricultural School, Massachusetts.

studied and carefully planned at the school, but carried out, with supervision throughout the producing season by agricultural instructors, on the home farms of the pupils.

These high schools employ an agricultural specialist, who devotes his entire time to the teaching of agriculture, the supervision of the "Home Projects," and advisory work amongst the farmers.

The emphasis put upon the "Home Projects" insures that the agricultural instruction shall not be academic. Where agricultural instruction is really scientific, there should be no hesitation in putting it to the test of producing work. Approximately one-half of the school day is devoted to the project study and project work.

A continuous line of development in scientific studies is carried on throughout the four years, *e.g.*, biology of farm plants, farm animals, agricultural botany, and agricultural chemisty are taught in such a way

as to show their relationship to the productive work the boys are carrying on. In addition, the boys receive—

(*a*) English every year.

(*b*) A course in history, civics, agricultural economics, hygiene, and physical training.

As a matter of fact, the percentage of time given to these various subjects works approximately as follows:—

50 per cent. is devoted to project studies and project work.

30 per cent. is devoted to subjects whose relationships to agriculture are strongly emphasized.

20 per cent. for non-agricultural subjects, *e.g.*, English literature, civics, history, duties of citizenship, and wholesome recreation.

Last year, the attendances at the agricultural high schools of Massachusetts were as follow:—

1. *Special Schools of Agriculture.*

Essex County Agricultural School	171
Norfolk County Agricultural School	53
Bristol County Agricultural School	50
Northampton Agricultural School	43

2. *High Schools with Departments of Agriculture.*

In the high school—numbers of pupils taking the agricultural course.

Reading	32	Orange	15
Concord	29	Harwich	11
Hadley	21	Marlborough ..	10
Ashfield	16	Clinton	10
Easton	15	Brimfield ..	10
Leominister ..	14	New Salem ..	9
Newton	13	Petersham ..	9

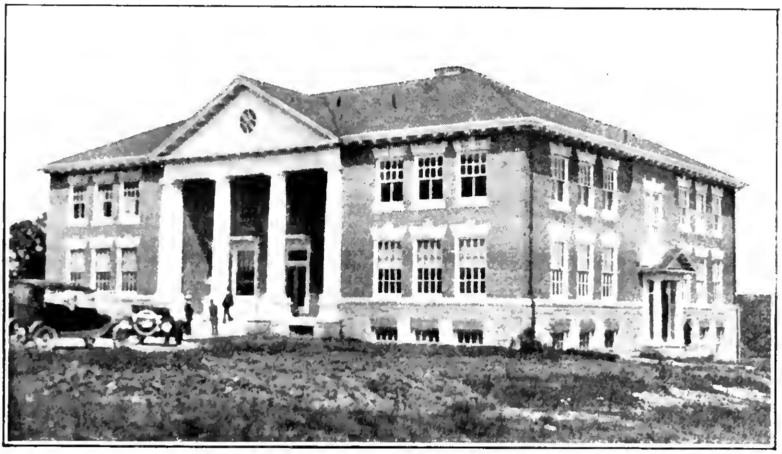
As already stated, the interesting and essential feature of these schools is that the boys are taught agriculture by means of the "Home Project." That is to say, each boy is given some agricultural project—by the sowing of a crop, the caring for animals—and his whole school instruction is centred around this project. In 1917, each of the 523 boys in the agricultural classes of high schools or the county schools of agriculture either planted a vegetable garden, raised a few acres of staple crops, raised several hatches of chickens, or reared pigs or calves to selling age, &c.

I visited a number of the boys who were engaged in this project work, and was surprised at the fine work they were doing and their general attitude towards the school work and farming problems. Some were caring for a group of five Holstein cattle, growing feed for them, weighing and testing the milk, and keeping exact records of cost of production. Others were raising three to five pigs, or keeping a flock of pullets, raising chickens, growing potatoes, maize, and vegetables. The Commissioner for Vocational Education informed me that the total earnings of these boys last year was 120,309 dollars (£25,000). One boy—P. O'Connel—a third-year pupil of Bristol County, seventeen years of age, was keeping exact feeding and milking records from five cows, growing 2 acres of corn, raising an acre of potatoes, and renovating an old orchard for his "third-year project."

The County agricultural schools are well equipped with teachers and laboratory facilities. The cost of maintenance for last year of Essex County School was 49,000 dollars (£10,200). There are fourteen teachers at Essex Agricultural School—all trained agriculturists—and an attendance of 171, with 125 on the waiting list.

The principle underlying the Massachusetts system of vocational agricultural education is the centralization of instruction in agriculture round some project performed on the home farm or some rented land, and the correlation with this project of studies in English, civics, and agricultural science.

Mr. R. W. Stimson, of the Massachusetts Board of Education, the founder of the "Home Project" idea, accompanied me on a visit to these various agricultural schools, and explained that the basic idea is to graduate the work on home projects from the simple to the complex. The first year the project is usually "home gardening." This forms a modest approach to the farmer. There are motives for having a



Bristol County Agricultural School, Massachusetts.

good garden on every farm. They wish the farmer to have something other than a diet of salt pork and potatoes. The farmer is usually very willing to be relieved of the work of attending to the vegetable garden. The boy, under supervision of the teacher, plants vegetables at appropriate times, and tends to them in a manner which is in accord with best practice.

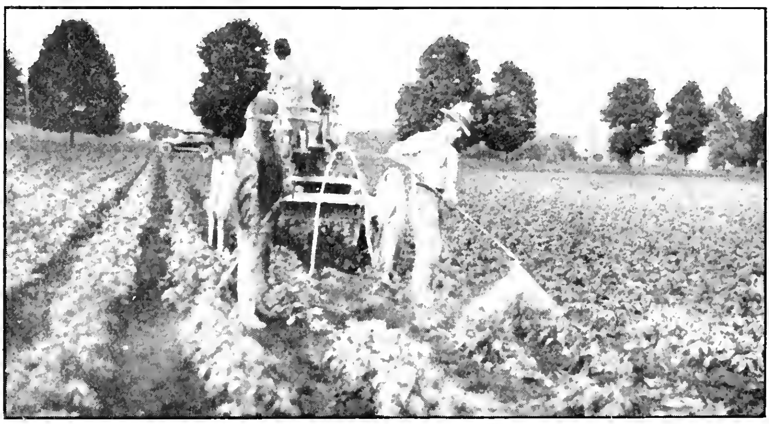
The boy keeps accurate accounts of the cost and worth of these vegetables, and generally surprises his father at the end of the year by submitting an exact statement of what the vegetables would have cost the family if purchased in the market. The farmer sees that the boy is an economic factor in the household, and the boy gets appreciation and commendation. The instructor, too, has established a right to come on to the farm. The farmer will want to get as much out of the instructor as possible.

He will try to get information of value, or he may try to "pump" the instructor and "trip him up." The instructor is always a graduate

of an agricultural college, with at least two years' practical experience behind him.

In that first year the teacher has either made a place for himself on that farm, or he has demonstrated that he has no place in that farming community. The second year, the boy proceeds to something demanding more care to detail, viz., the raising of poultry and the incubation and rearing of chickens. The matter is carefully considered in school in great detail. All agricultural instruction for the year is centred round profitable poultry production, and the technical details necessary for successful poultry management and the incubation and rearing of chickens. Then comes the practical test—the actual rearing of, say, 100 or 200 chickens. The instructor, as usual, visits the boy on the farm, and encourages him to keep exact and systematic records. The third year, a farm crop is raised. An acre of potatoes, a couple of acres of corn, or an acre of mangolds.

Again, care is paid to details of cultivation, fertilization, and selection. Finally, the task of attacking such problems as the control of a



Spraying Potatoes, Bristol County Agricultural School.

few cows, raising a litter of pigs, or the balancing up of the farm crops and stock, *i.e.*, studies in farm management are undertaken in the fourth year.

As an example of a poultry project, I may mention one of a number of cases which came under my personal notice in the States of New York and Massachusetts.

Trumansberg is a small town in the State of New York, 10 miles from the State college of agriculture, with a population of 1,100. At the time of my visit to the local high school there were seventeen boys engaged in project studies. One boy—Harold E. Wilkin—sixteen years of age, had taken over from his father, last December, 679 mixed hens, for which his father debited him 126.32 dollars (£26 6s. 4d.). The father informed me that prior to the project work his boy showed very little interest in agriculture. Now, however, the boy was intensely interested in his work.

This boy had kept a record of all the feed consumed by the birds, the time spent daily on the project, and the cost of the feed, shell grit,

charcoal, &c., required for the birds. The first thing young Wilkin did was to weed out 210 fowls of poor type. Twenty-eight were lost by death and exposure to cold. From the balance he obtained the following:—

December	1,360 eggs
January	2,216 ,,
February	3,816 ,,
March	5,991 ,,
April	6,292 ,,

The season proved to be one of the coldest ever experienced in New York State, but, despite this, egg production and the results of his incubation proved satisfactory.

Here are the results of his hatching costs, which I took from his record book:—

Incubation Costs.

	dollars.		£	*s.*	*d.*
$98\frac{2}{3}$ dozen eggs at .492 dollars per dozen ..	48.54	=	10	2	3
30 gallons of kerosene at 14 cents per gallon	4.20	=	0	17	6
63 hours labour	11.34	=	2	7	3
Disinfectant	.05	=	0	0	$2\frac{1}{2}$
Interest and depreciation on incubators—90 dollars at 6 per cent. for three weeks ..	.31	=	0	1	$3\frac{1}{2}$
Total expenses of hatch	64.18	=	13	8	6
Number of chickens reared					629
Total cost per chick	10.2 cents	=			$5\frac{1}{8}$d.

This boy was learning agriculture by the practice of it. His whole life for the time being was centred on those fowls, and he would read anything which helped to give him information on profitable fowl raising. Next year, the project would be farm crops; the following year, pig raising.

In December last he owed his father 126.32 dollars (£26 6s. 4d.) for the fowls. In April, his debit balance was 30.36 dollars (£6 6s. 6d.); *i.e.*, he had paid all the expenses of feed, labour, &c., and had reduced his indebtedness from 126 to 30 dollars in four months. He expected to break even for May, and then he would own the fowls and be free from debt.

One great feature about this project work is the opportunity it gives the teacher. The teacher explains to the parents that these schools of agriculture are conducted on the principle that there are educational opportunities at home, and that the school, in order to perform its functions properly, must make use of those opportunities. Besides the educational value to the boy, the home project plan gives to the teacher a better idea both of the home conditions and of the farming conditions in general. It also helps him to keep his teaching within the realm of possibility.

These high schools work in closest co-operation with the Massachusetts Agricultural College and the United States Department of Agriculture. All joint undertakings, *e.g.*, promotion of boys' and girls' club work, making of farm management surveys, &c., are covered by written memoranda of agreement between the authorities concerned.

Mr. Stinson stated that the "Home Projects" are important because they illustrate improved methods and provide convenient facilities for group teaching in observational and practice work. They emphasize them not merely because they aid in preventing the agricultural teaching from becoming too bookish, but because each project usually becomes a demonstration in its neighbourhood of a better method of farming than that generally practised in the vicinity, but also because things done by farmers on their own farms are usually more convincing than things done on the school premises.

Such is the type of vocational education given in Massachusetts. That the system has some considerable merit is evidenced by the fact that Congress has passed a Bill authorizing the Federal Government to spend several million dollars per annum on vocational education.

Pupil at work on a "Home Project," Bristol County, Massachusetts.

The Federal and State Governments Co-operate For Vocational Training in Agriculture.

The Smith-Hughes Act, approved on 27th February, 1917, provides for co-operation between the Federal Government and the States for the promotion of vocational education in agriculture, home economics, and industry.

This Act insures annual appropriations for the stimulation of vocational education, and sets up definite conditions under which moneys will be advanced to the States.

For the financial year 1917-18, the Act provided for an expenditure from Federal funds of 1,094,000 dollars (£230,000), increasing to 4,317,000 dollars (£900,000) annually from 1927. This money will be used for two purposes—

(1) The cost of training teachers for vocational work.
(2) The payment of salaries of teachers of vocational work.

The aim of the Bill is to initiate a plan of agricultural education of secondary grade. In doing this, the expenditure of Federal funds has been amply safeguarded, and the autonomy of the States has been entirely preserved.

The conditions under which grants are made are that—

(1) All schools receiving Federal aid must be under *public* supervision or control.
(2) The controlling purpose of the Act is to provide education which will provide *useful* employment.
(3) The instruction given under the Act must be of secondary grade.
(4) Federal money must be matched, dollar for dollar, by State money.

"Home Project."—Care of two brood sows.

The Far-sighted Policy of the Federal Government.

The Federal Government, under the Land Grant Act of 1862, donated large tracts of land to the States for the creation of the agricultural colleges. Under the Morril Act, Congress voted 50,000 dollars (£10,500) per annum for the maintenance of the instruction work in each of the 48 State agricultural colleges.

Under the Hatch Act and the Nelson Amendment, the Federal Government appropriated 30,000 dollars (£6,250) per annum for the maintenance of each State experiment station to carry out investigations and research work in agriculture.

Under the Smith-Lever Act, Congress appropriated sums which in 1923 will reach 4,580,000 dollars (£950,000) annually for publicity

work or extension work—bringing the teachings of the colleges and stations to the last farm and the last farmer.

And now, finally, under the Smith-Hughes law, the Federal Government has agreed to provide over 4,000,000 dollars (£830,000) per annum for vocational education.

Truly, the men who founded the agricultural education systems of the United States laid their foundations deep and well.

Food Production, Shipbuilding, and Supply of Men for the Army.

Just at present three great problems confront the nation—food production, shipbuilding, and the training and munitioning of men for the army.

America is facing these with characteristic vigour and foresight.

Under food production two factors are involved—the actual production of increased quantities on the farms, and the conservation of what foodstuffs are in the country by prudent consumption and prevention of waste.

Boys' Clubs in Massachusetts.
A twelve-year-old lad and his plot of vegetables.

The production of increased quantities is being provided for in a large number of ways—fixing the price of staples for the next harvest; extensive use of tractors; recruiting of farm labourers from voluntary women workers; utilizing all boys of high school age during June, July, and August (the three summer months); establishment of machinery in each State for mobilization and direction of farm labour. Then from thousands of platforms speakers urge increased food production; the 3,000 county agents—one in nearly every agricultural county of the United States—send out literature and personally urge farmers to increase production. In crowded cities, such as New York, Boston, and Chicago, the parks in the city are laid out in model vegetable gardens to bring before the citizens how each can turn his back yard to account. All kinds of vegetables, neatly set out in rows, labelled with directions as to how and when to plant, may be seen growing in the gardens of the large cities. In New York, thousands of

citizens pass these gardens on their way to Broadway past the Public Library every day.

Then, again, prevention of waste and conservation of foodstuffs by judicious consumption is encouraged in every way through a nation-wide organization with machinery in every town, hamlet, or city.

In many cases heavy fines have been imposed for wilful waste. More is done, however, by the voluntary co-operation of the public and the eating houses with the Food Administration. In all the large cities, too, you will find numerous centres where canning demonstrations are held, at which people are invited to can perishable fruits and vegetables in standardized receptacles with standardized methods. Last year, 875,000,000 lbs. of canned fruit and vegetables were put up by the

"Food will win the War."

A park in New York City sown down as a demonstration vegetable garden to arouse interest in the growing of vegetables. Hundreds of thousands of "War Gardens" have been planted by civilians of the United States during the past twelve months.

American. Bread, such as we know it in Australia, is unobtainable. The bread now used consists largely of corn, barley, or rice-flour. All this is effected without a word of grumbling on the part of the people. The press supports the Administration with remarkable loyalty and apparent good-will.

The shipbuilding yards have been accomplishing wonders lately. Some months ago there was considerable dismay shown in some quarters at the apparent failure of the Government shipbuilding plans. The latest figures for construction are, however, amazing. In a report issued at Washington a few days ago from the Department of Commerce it was stated that during the first five months of this year there were built in the United States 629 vessels with a gross output of 687,055

tons. The report further stated that in January, 1918, 57 ships of 64,759 tons were built. In May, 1918, however, 185 ships, with a tonnage of 194,465 tons, were built.

The total number of vessels flying the Stars and Stripes in January was 26,742, representing 9,343,224 gross tons of shipping.

As I mentioned in my last letter to you, Mr. Hoover, the Food Administrator, told me that the Shipping Board intended to build 600,000 tons a month by January next.

Then, as regards men, the eastern cities seem crowded out with men in khaki. The President, Mr. Wilson, at the Metropolitan Opera House, New York, said that the army in France would not be fixed at any definite limit, but that he proposed to send as many men across as were necessary to obtain a complete victory over the Hun. It is generally believed that over 2,000,000 Americans will be in the firing line or in France before the end of 1918.

Yes! America is tackling the war problems with great vigour and energy. I have noticed a remarkable change come over the community during the last two months. The people and the leaders appear to realize that the world's greatest Democracy is on trial—in the melting pot—and they hope and believe that the test will prove that the metal is free from dross.

DOWNY MILDEW, *Plasmopara viticola.*

(B. and C.), B. and de T.

By F. de Castella, Government Viticulturist, and C. C. Brittlebank, Government Pathologist.

This unwelcome addition to our fungus flora has not unnaturally caused consternation in those districts of north-eastern Victoria where it first made its appearance. The foothold it obtained here during the 1916-17 summer permitted an early start for the disease in October, 1917. Favoured by quite abnormally wet weather, the fungus developed with an intensity recalling the violent invasions not uncommon in France. The 1918 vintage will long be remembered in north-east Victoria as the mildew year, the loss of crop being generally estimated at over 90 per cent.

The Rutherglen Outbreak of 1917-18.

This altogether disastrous visitation was the result of a combination of circumstances. The mildness of the first outbreak (1916-17), and the quite insignificant damage resulting therefrom, lulled growers into a false sense of security. Warnings given at a lecture at Rutherglen in February, 1917, when preparations for a spraying campaign in the following spring were recommended, were almost entirely unheeded.

Until the end of October no signs of the fungus were reported. Favoured by the almost continual October rains,* the disease suddenly appeared during the last days of that month. From its first appearance it spread with such rapidity and intensity as to constitute an absolute disaster. Though all growing parts of the vine were more or less

* The rainfall at Rutherglen during the 1917 spring was altogether abnormal; 591 points was recorded for October, though the average for the month (nine years) is only 133 points. During October, 1917, rain fell on no less than seventeen days out of the 31.

affected, the damage was mainly due to Bunch Mildew or Grey Rot, the most dreaded form of the disease. Within a few days of the first manifestation, the bulk of the embryo bunches were white with the efflorescence (Conidiophores) of the fungus; the crop was doomed.

Appearance of the Disease in Other Parts of the State.

The extension of the disease to other districts during the 1917-18 summer was characteristic of the extraordinary powers of dissemination of the mildew fungus. Obviously, the date of first appearance could not be accurately ascertained in every case, but the following notes as to the dates on which the fungus was first identified in several districts should prove of interest, as instancing its rapid spread; they should

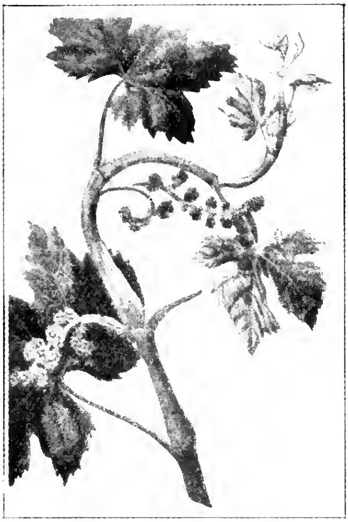


Fig. 1.

Grey Rot or Bunch Mildew. Diseased vines shoot in early spring—lower bunch covered with characteristic white down, which is also visible on upper half of stem, the twisting of which is due to fungus action. Reproduced from *Le Mildiou* by L. Ravaz. (This form of the disease was responsible for destruction of the grape crop in N.E. Victoria last spring).

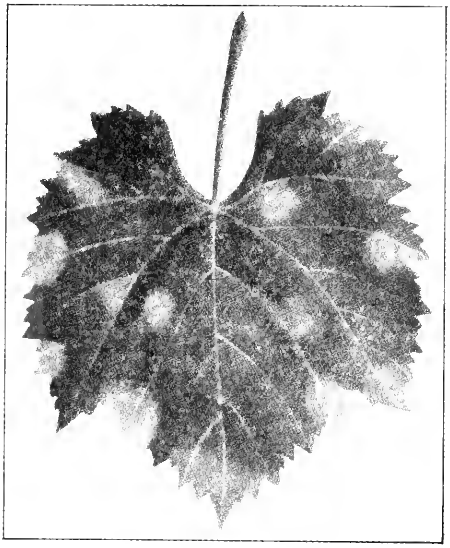


Fig. 2.

Oil spots on upper side of leaf; corresponding with these on the under-side, the white down develops in moist weather. (After Ravaz).

serve as a warning to those districts which the fungus has not yet reached.

In the late autumn of 1917 the furthest point to which mildew had spread appears to have been Glenrowan, some 40 miles as the crow flies from Rutherglen, where the disease was first found during the previous January.

It was subsequently identified at the following places:—

Violet Town, on the 11th December, 1917;

In the Yarra Valley district, near Healesville, on the 18th January, 1918; within a few days the fungus was abundantly in evidence throughout the whole Lilydale district. Healesville is distant from Violet Town some 70 miles as the crow flies. In about a month the fungus had thus traversed this distance and crossed the Dividing Range.

At Sunbury, on 1st February;

At Whittlesea, about the same date.

Meanwhile, the fungus had made its appearance at Tabilk, Shepparton, and Mooroopna, in the Goulburn Valley.

On 17th April, the fungus was found to be widespread throughout the Nyah district, as well as at Swan Hill, Tresco, and Cohuna; at the last-named place it was by no means plentiful.

Contamination was plentiful throughout the metropolitan area late in the autumn.

Mildura was visited and inspected on 18th February and 1st May, but several days' careful examination failed to reveal any trace of the fungus; it has either not reached so far, or, if present, has spread so little as to escape discovery.

It will be seen that the disease spread in one brief season from the Rutherglen district to parts a couple of hundred miles distant. In most of the above localities severe damage was not caused, mainly owing to the first appearance of the disease being too late to permit bunch infection, but premature fall of the leaves was in many cases responsible for a marked diminution in the sugar content of the grapes.

The efficacy of spraying was strikingly demonstrated at one of the large Rutherglen vineyards, portion of which was sprayed in October, 1917, 95 per cent. of the grapes being saved thereby, whilst the untreated portion lost almost the entire crop.

In vineyards attacked late, at Sunbury and Whittlesea, where spraying was carried out early in February, the foliage suffered little, and the grapes ripened. Unsprayed control plots in the same vineyards lost all their leaves, the fruit ripening very unsatisfactorily in consequence, though it was only slightly affected by brown rot.* In these districts, mildew only appeared after Christmas; earlier spraying to combat bunch mildew was thus unnecessary.

In New South Wales, serious loss was confined to the Murray vineyards across the river from Rutherglen and Wodonga, where the fungus appeared shortly after its first discovery in Rutherglen (January, 1917). During the 1917-18 summer, however, it appeared at such widely distant places as Yanco, Mirrool, and the Hunter River district; at these, owing to the lateness of its first appearance, the vines escaped bunch mildew, and the yield suffered little. The fungus has not yet been found in South Australia, Western Australia, or Queensland.

As Regards the Future.

Forewarned by last season's disaster, North-Eastern vine-growers are no longer in doubt as to the evil potentialities of the new disease. Outfits and materials have already been secured for the indispensable spraying campaign of the coming spring. It is to be feared, however, that in more recently invaded districts, where only slight damage resulted last vintage, the peril is less thoroughly realized. Here the situation is exactly similar to-day to what it was at Rutherglen a year ago. To growers in all districts where the fungus has yet appeared, the following warning must be emphatically urged, *that, given two contingencies,*—(a) *similar weather conditions to last year; and* (b) *absence of preventive spraying—no grapes will be vintaged.* Even districts apparently as yet unvisited, such as Mildura, should likewise take warning.

Treatment for the prevention of mildew (cure is impossible) was dealt with in these columns nearly a year ago.†

* By brown rot is understood the form of the disease when the berries are attacked when more than half their full size, as distinguished from grey rot or bunch mildew, in which case infection takes place before or shortly after blossoming.

† November, 1917. A reprint of this article will be posted on application.

It will suffice to recall here that 2 per cent. Bordeaux mixture (2 lbs. copper sulphate to 10 gallons of water, with enough lime of good quality to neutralize) is the standard spray; its wetting or spreading power can, with advantage, be increased by the addition of casein at the rate of 1 oz. to 10 gallons of spray mixture.*

How often must vines be sprayed to insure safety? The answer depends on weather conditions. Given those which prevail in France during spring and summer, the frequent sprayings common in that country would, of course, be needed here; fortunately, our climate differs altogether from that of France. In normal seasons we have even drier conditions than prevail in Algeria. It is, therefore, probable that mildew control will be at least as easy here as it is in Northern Africa, where the disease is not feared to nearly the extent that it is in France. Indeed, our experience of it in so abnormally wet a season as the last is most reassuring; it encourages the hope that one spraying in the early part of the season (before Christmas) will save the grape crop. A second spraying in late January or early February will probably be required, in most seasons, to protect the foliage, thus allowing the grapes to ripen properly, and to accumulate the reserves essential for the following season. Its utility will depend much on the prevalence of the fungus during the spring.

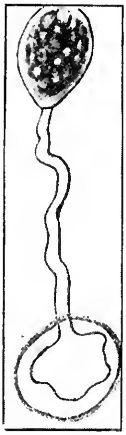


Fig. 3.

Macroconidium (above) resulting germination of cospore (below). The Macroconidium is itself almost ready for germination; its contents have divided into numerous Zoopores. After Ravaz. (Highly magnified.)

Save in altogether abnormal seasons, these two sprayings should suffice. We must not forget, though, that we grow the same vines as in France, and we have the same disease to deal with. Should we, therefore, have the misfortune to experience the same kind of weather, similar treatment to that needed in France can alone protect our vines.

The First Spring Spraying.

What our vine-growers particularly want to know just now is the most opportune moment for the first spray, a question which it is not nearly so easy to definitely answer as might at first appear. The chief object of the present note is to endeavour to throw some light on the subject.

Spraying being essentially preventive, it must precede infection; once the fungus has penetrated the tissues, any fungicide application is powerless so far as that particular invasion is concerned.† "Too late" spells disaster; it is, however, also possible to be too early. Any

* For 50 gallons of spray mixture take 5 oz. Casein; mix (dry) with three or four handfuls of fresh slaked lime in powder; make into a smooth paste with a little water; when quite smooth add water to make half a gallon; pour through a sieve into the 50 gallons of Bordeaux mixture.

Casein may also be dissolved in 10 per cent. washing soda solution (1 lb. to 1 gallon).

Casein must only be added to *alkaline* "Bordeaux." If it fails to redden phenolphthalein test paper, add more lime until the paper changes colour.

The use of casein is to be recommended for the first spraying; it increases bunch protection by enabling these to be more thoroughly wetted.

† The spray material remaining on the vines will, of course, serve to combat the next invasion which, after about seven days (the period of incubation) will result from the previous one if weather conditions render it possible.

fresh growth made by the vine subsequent to a spraying is quite unprotected thereby, and liable to contamination. Vegetation is very active in early spring, and a large quantity of unsprayed growth constitutes a dangerous breeding ground, which may easily become a source of bunch contamination in a wet season. Even the sprayed parts of the vine soon lose a portion at least of their protective copper through the action of rain, &c. A vineyard sprayed some days before infection can take place is much less efficiently protected than one sprayed immediately before the dangerous moment. If sprayed too early, it may even be necessary to repeat the treatment. Were it possible to exactly predict the day on which infection is to be expected, the best moment for spraying would be the morning of that day.

The first invasion of spring results from the germination of the wintering spores (oospores) formed towards the close of the previous season, and contained in leaf *débris* in the soil; neither Conidia (summer spores) nor Mycelium seem able to survive the winter. Oospore germination has been followed in the laboratory, notably by Ravaz in France and Gregory in America. Earlier attempts were often unsuccessful, owing to the specimens being insufficiently wetted during germination; they must, in fact, be bathed in water during the whole process, the duration of which depends on the temperature. At 52 deg. F., it lasts more than a day; at higher temperatures, a few hours are sufficient. It follows that it is only warm, and at the same time very wet, weather which would favour wholesale oospore germination, conditions which are rare in early spring.

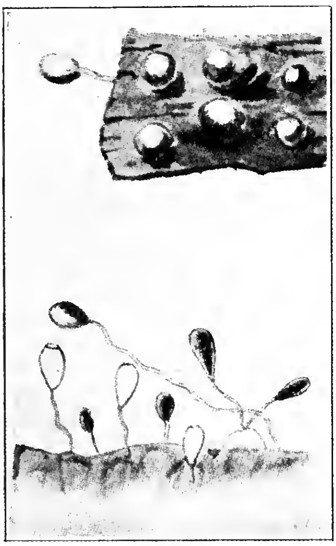


Fig. 4.

Macroconidia produced in spring from oospores contained in debris of infected leaves. After Ravaz. (Highly magnified.)

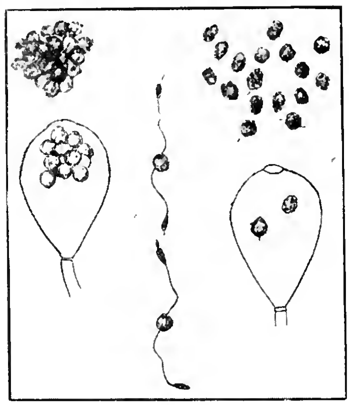


Fig. 5.

Macroconidia shortly after their germination—the Zoospores have nearly all been expelled. The two zoospores in the centre of the figure show the flagellæ (tails), which enable them to swim about in water. After Ravaz. (Highly magnified). Conidia (ordinary summer spores) germinate in similar manner, but each one only produces four to six zoospores.

Under suitable conditions of moisture and temperature, each oospore emits one or two (rarely three) slender filaments, each bearing one large

spore of similar type to ordinary summer spores, or Conidia, but considerably larger, hence the term "Macroconidia." These germinate in water in the same manner as the ordinary summer spores, *i.e.*, by Zoospores.* Should rain continue, these are splashed on to the lower leaves of the vine, which they penetrate through the stomata or breathing pores, forming in due course, after the lapse of the incubation period (7 days), the characteristic oil-spot; should weather conditions continue favorable, sporulation shortly occurs in the shape of the appearance of the patches of white down on the under surface of the leaf. Subsequent invasions occur, as has been previously described, whenever weather conditions and absence of protective copper render fresh infection possible.

Conidia germination likewise is only possible in water (rain or dew-drops); it is influenced to a very considerable extent by temperature.

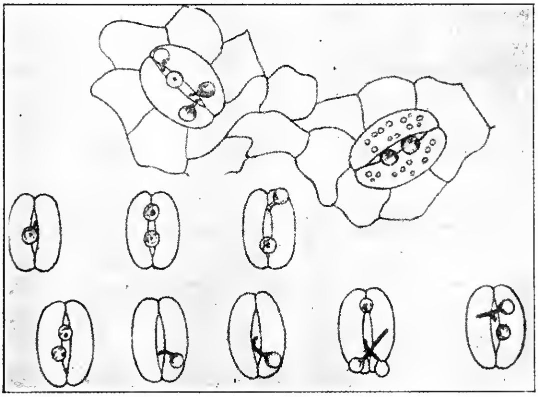


Fig. 6.

Penetration of the vine tissues by the Mildew Fungus. The germ tubes from the zoospores are entering through the stomata or breathing spores of the vine. Above—zoospores from macroconidia Below—zoospores from conidia (ordinary summer spores). After Ravaz. (Highly magnified.

Below 46 deg. F., and above 85 deg. F., it does not occur. Germination takes four or five hours at 46 deg., 40 minutes at 77 deg., and twelve hours at 85 deg. It appears to be most active in the dark. Zoospore germination takes place rapidly—20 to 25 minutes after expulsion from the conidum their germ tube has already sprouted. It follows that, at the most favorable temperature (77 deg. F.), contamination may take place in an hour and a half.

Sporulation of oil-spots (appearance of the white down) depends on moisture (in dry air it does not take place), and also on temperature; it scarcely occurs below 55 deg. F., nor above 82 deg. F.

The above notes from Professor Ravaz's recent article (Progrès Agricole, 19th May, 1918), will give an idea of the moisture and temperature requirements of the different stages of the mildew fungus, and show the extent to which the evolution of the disease depends on the

* Conidia usually emit four to six Zoospores; Macroconidia send out a far larger number—15 to 20.

season. In reality, it is not one unique invasion which has to be combated, but a series of them, one (or more) of which may be of far greater intensity than its predecessor. In the French climate, there are often several intense invasions in a season, hence repeated spraying is necessary. Here, where it is hoped that one spring spraying may suffice, it will be essential to provide against the first dangerous infection, and to thoroughly spray the vines immediately before it takes place.

As a rule, the first invasion—that resulting from oospore germination—is on a limited scale, though it is possible to imagine weather conditions such as would permit of its being widespread. Even if slight, it will, after seven days' incubation, result in the appearance of a greater or lesser number of oil-spots, which will (weather, of course, permitting) provide abundant spores for further and more general invasion.

In France, until recently, dates for spraying were more or less arbitrarily fixed. Most of the older text books recommend a first spraying three weeks before blossom, a second at blossoming time, a third a month later, and a fourth a month later still. This course has recently been adversely criticised. In the cold French spring, mildew often fails to appear in May (November here), in which case the first spraying would be wasted. Fixing the dates according to the development of the fungus is far more logical.

In Victoria, we have only one year's experience of the fungus; unfortunately, a disastrous one. At Mount Ophir, where 95 per cent. of the crop was saved on the portion of the vineyard which was sprayed, this work was commenced on the 24th October, and continued with good results until early in November (about the 5th). Any spraying carried out later proved quite powerless to save the crop. Should this coming spring prove similar to the last, it would be safe to await the 20th October before spraying. We may, however, have an earlier spring than last year, in which case oospore germination (the first invasion) might be advanced somewhat. Earlier spraying than last year would then be desirable.

Owing to similarity of climate, Algerian experience of mildew should prove of considerable value to us. In that country, the date of first appearance varies greatly from season to season. During the past ten years it has seldom been reported before the latter part of May (November here), whilst in some years it has not shown up before June or even July. Its first appearance in May (or earlier) was in the years 1908, 1909, 1913, 1915, 1916 and 1918. In only two of these was it observed before the middle of the month, viz., in 1918, quite early May, and 1916, when it was first observed at the end of March (September here) and beginning of April (October here), though early spraying and timely hot winds (Siroco) prevented serious damage. A similarly early start is by no means impossible in our climate which, at least on the Murray, is warmer than most of Algeria. An earlier outbreak than that of last year may, therefore, have to be reckoned with in some seasons.

In a general way, and as far as it is humanly possible to predict, it may be laid down that spraying should be completed by the 20th October. Needless to say, the closest possible watch should be kept for the very first manifestations of the disease; but whether it show up or not, spraying should be proceeded with, and completed by the above date.

ORCHARD NOTES.

Spraying for peach aphis will be one of the necessary works this month. Lime sulphur is the spray to be used before the vegetative buds burst.

As soon as the petals have dropped, any of the nicotine sprays should be used. If tobacco water be used, this may be made as strongly as possible, not making the spray any weaker than 1 pound of stems to 10 gallons of water. Where Black Leaf 4°, Nikoteen, or any other commercial preparations are used, the directions on the package should be followed.

Repeated sprayings will be necessary so long as any live insects remain.

The time has also arrived when spraying is needful for the prevention of all fungus diseases, such as shothole or scab, black spot, leaf rust, leaf curl, &c. In the case of these pests, "prevention better than cure" is the invariable rule; and to delay beyond the correct period the application of the necessary sprays is to court disaster. For black spot of the apple and pear, the spraying should be performed as soon as the earliest flowers are opening. For shothole and scab the time to spray is before the flower petals expand; and the spraying may be repeated, if necessary, after the fruit has set.

For rust and leaf curl the spray should be applied before any sign of the trouble appears on the foliage; thus, if the fungus were present during the previous season, it will be necessary to spray early to combat it successfully.

The basis of all the successful fungicides is sulphate of copper or bluestone. Bordeaux mixture (a mixture of bluestone, lime, and water, known as the 6.4.40 formula), is used; the materials and quantities being 6 lbs. bluestone, 4 lbs. lime, and 40 gallons water.

Another spray, and in some locations equally successful in its results as the Bordeaux mixture, is the copper-soda spray, the proportions being 6 lbs. bluestone, 8 lbs. washing soda, and 40 gallons of water. In each case the materials should be separately dissolved, and then evenly and simultaneously mixed in a third vessel.

The excellent results attained at the Drouin experiments, as detailed by Messrs. Laidlaw and Brittlebank, in their black spot experiments, show that black spot of apple may be readily combated. A full report appeared in the *Journal* for last month, and this should be studied by those who intend spraying for black spot.

REMINDERS FOR OCTOBER.

Live Stock.

Cattle.—Except on rare occasions, rugs may now be used on cows at night only. Continue giving hay or straw, if possible, to counteract the effect of green grass. Be prepared for milk fever. Read article in *Year-Book of Agriculture*, 1905, page 314. Give calves a dry shed and a good grass run. Continue giving milk at blood heat to calves. Be careful to keep utensils clean, or diarrhœa will result. Do not give too much milk at a time for the same reason. Feed regularly with regard to quantity and time. Give a cup of limewater in the milk to each calf, also place crushed oats or lucerne hay in a trough so that they can eat at will.

Sow maize for summer feeding and ensilage, also Japanese millet for grazing during dry summer months. Mow surplus grass for hay. If cut when the grass

or trefoils are in bloom, grass hay will be as good fodder as any serial hay. If top-dressed with phosphatic or farm yard manure, good returns will be obtained from grass hay; it has also the great advantage that mice will not work in it. Cut 1 acre for each cow in the herd; it will keep until the next drought if protected from the weather.

Pigs.—Supply plenty of bedding in warm, well-ventilated styes. Keep styes clean and dry, and feeding troughs clean and wholesome. Sows suckling young should be well fed to enable them to produce plenty of milk. Give young pigs pollard and skim milk in separate trough as soon as they will take it, and keep them fattening from the start to get them off as early as possible. Give a tablespoonful of bone meal, or half that amount of mineral phosphate, per 100 lbs. live weight in food daily. If pigs are lousy dress them with kerosene emulsion or sulphur and lard, rubbing well into the crevices of skin, and disinfect styes. Pig breeding and feeding should be very profitable for a long time to come, and it should be safe to launch out now.

Sheep.—Shear as early as the weather will permit, and avoid the usual excessive dust in travelling to, and yarding at sheds. Burr and seeds also collect on the fleeces if shearing be left until late in the season, particularly with lambs. Shear all lambs intended to be held over—they thrive better and make more growth through the ensuing summer and autumn. Fleeces from well-bred sheep should be skirted with care, the better the class of wool the greater the necessity. From fleeces that have become dry and earthy on the backs, remove only the merest stains; there is little advantage in skirting these. It is better management to have ample tables and extra hands skirting closely than to hastily tear off unnecessary wool and then employ men at other tables to sort "broken fleece," "first," and "second" pieces, &c. All stains must be removed from ewes' fleeces, and pizzle stains from the bellies of wethers. Keep separate all coarse fleeces from the finer sorts, and in merinos the yellow and mushy from the shafty and bright. Skirt all hairy thighs from crossbred fleeces. Avoid sending wool to market in long, round-sided bales, known as "sew-downs." Press in a box-press, forming square sides. Brand bales neatly, on one side only, and not with sheep-branding oil, tar, or paint. Stencil plates and branding ink can be obtained on application to the respective brokers.

At first signs of scour drench with turpentine and oil. This preparation is now procurable in emulsion form, and thus the fear of choking is removed. If discharge be dark and accompanied with mucus, yard over night, drench on an empty stomach, repeat again in about fourteen days, and in some cases a third dose will be necessary. Change to new pasture if possible, or give a little grain, whole oats for preference.

Poultry.—The bulk of incubation should cease this month—late chickens are not profitable. Devote attention to the chickens already hatched; avoid overcrowding. Feed with dry mash. Also add plenty of green food to ration, ordinary feeding to be 2 parts pollard, 1 part bran, and a little animal food after the first fortnight. Feed ground grain, such as wheat, hulled oats, maize, and peas, which should be fed in hopper to avoid waste. Grit or coarse sand should be available at all times. Variety of food is important to growing chicks; insect life aids growth. Remove brooders to new ground as often as possible; tainted ground will retard development.

Cultivation.

Farm.—Plant main crops of potatoes in early districts and prepare land for main crop in late districts. Fallow and work early fallow. Sow maize and millets where frosts are not late, also mangolds, beet, carrots, and turnips. Sow tobacco beds and keep covered with straw or hessian.

Orchard.—Ploughing and cultivating to be continued, bringing surface to a good tilth, and suppressing all weeds. Spray with nicotine solution for peach aphis, with Bordeaux mixture for black spot of apple and pear, and with arsenate of lead for codlin moth in early districts.

Vegetable Garden.—Sow seeds of carrot, turnip, parsnip, cabbage, peas, French beans, tomato, celery, radish, marrow, and pumpkins. Plant out seedlings from former sowings. Keep the surface well pulverized.

Flower Garden.—Keep the weeds down and the soil open by continued hoeing. Plant out delphiniums, chrysanthemums, salvia, early dahlias, &c. Prepare ground for digging and manuring for autumn dahlias. Plant gladioli tubers and seeds of tender annuals. Spray roses for aphis and mildew.

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INDIGENOUS FIBROUS PLANTS OF VICTORIA.

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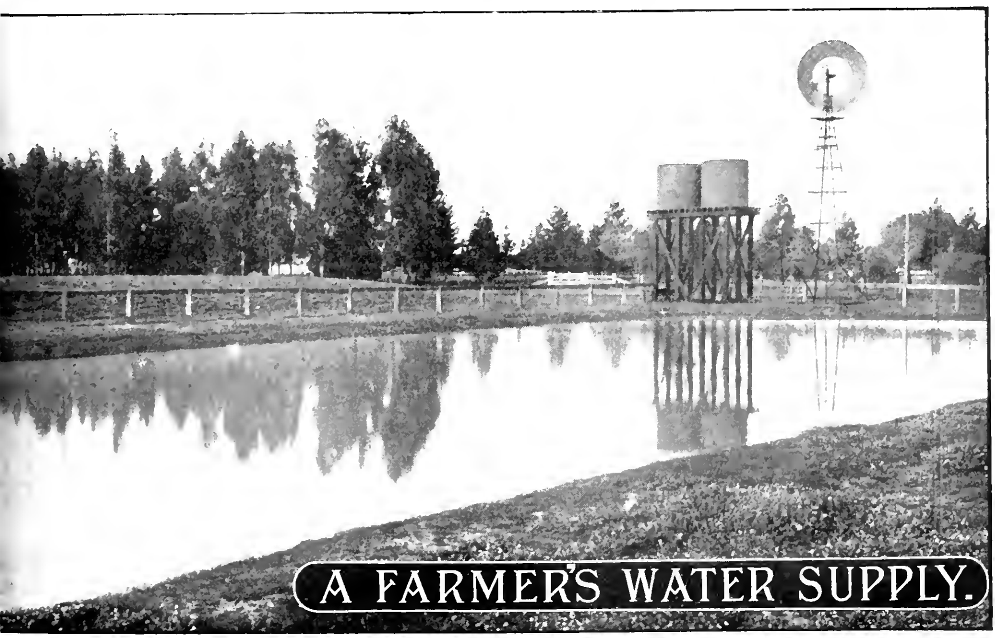
The Journal of The Department of Agriculture of Victoria, Australia.

October, 1918.



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VICTORIA, AUSTRALIA.

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THE JOURNAL

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OF

VICTORIA.

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AGRICULTURE AND AGRICULTURAL EDUCATION IN CANADA.

Letter from Mr. A. E. V. Richardson, M.A., B.Sc., to the Director of Agriculture.

Canada's chief occupation is agriculture. Fifty per cent. of her annual production comes from field crops, from animals, cheese, butter, fruits, and vegetables; 40 per cent. in the form of manufactures; and 10 per cent. from the mines, forests, and fisheries. Over half of Canada's invested capital is in farm lands, and more than half of her people are engaged in the agricultural industry.

Canadians take pride in reminding their visitors that the Dominion has an area of one-third of the British Empire, and that it is larger than the entire United States and Alaska combined. A large portion of northern Canada, however, is unsuitable for agriculture, or for occupation, owing to the extreme cold.

The great agricultural wealth of Canada lies in the crops garnered from the long stretches of prairie extending from the Great Lakes to the Rocky Mountains.

Between two and three thousand American settlers, bringing their household good and equipment, stream across the American border every month to try their fortunes on these flat, treeless prairies, attracted by the lower priced, rich, black, fertile lands of Alberta, Saskatchewan, and Manitoba.

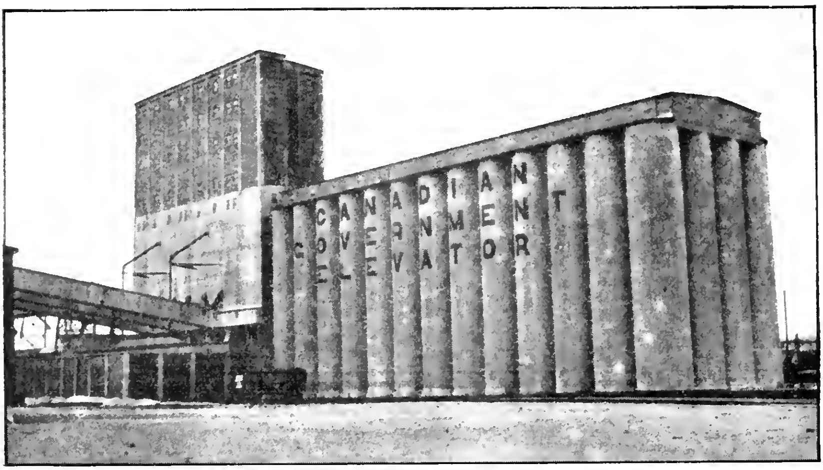
In these prairie provinces you see settlements and townships in the making. The soil has been waiting for the advent of settlement for ages. No clearing problems face the settler, for the prairie soil needs but to be stirred and broken to give forth abundant crops. Pioneer farming—more or less continuous cropping—is the usual rule in the prairies, but in the older settled parts crop-rotation systems are being developed. In the older provinces of the east agriculture has reached a high standard. The province of Ontario is pre-eminent among the Canadian provinces in

population, industry, education, agriculture, mining, and economic development. Of its total area of 260,000,000 acres however, only 12,500,000 acres are under cultivation; 100,000,000 acres are still Crown lands.

Ontario's field crops in 1917 were valued at £52,000,000. Ontario's principal crop is oats, of which 111,000,000 bushels were produced in 1917. Her principal stock industry is dairying; 126,000,000 lbs. of cheese were produced in 1916. The population of the province is about 2,500,000.

The three prairie provinces of Alberta, Saskatchewan, and Manitoba are approximately equal in area, each being about 160,000,000 acres. Only the southern portions of these three States have been brought under cultivation.

These are the three great wheat provinces of Canada. The wheat belt is 1,000 miles wide, and extends from the Great Lakes to the foot of the



Terminal Elevator at Vancouver.
(Capacity 1¼ million bushels—Cost £140,000.)

Rocky Mountains. The soil in this belt is chiefly a dark loam, rich in organic matter, and fertile. The land is gently undulating, and practically treeless. The southern portions of Alberta and Saskatchewan are subject to dry spells—which we, in Australia, would dignify by the term "drought."

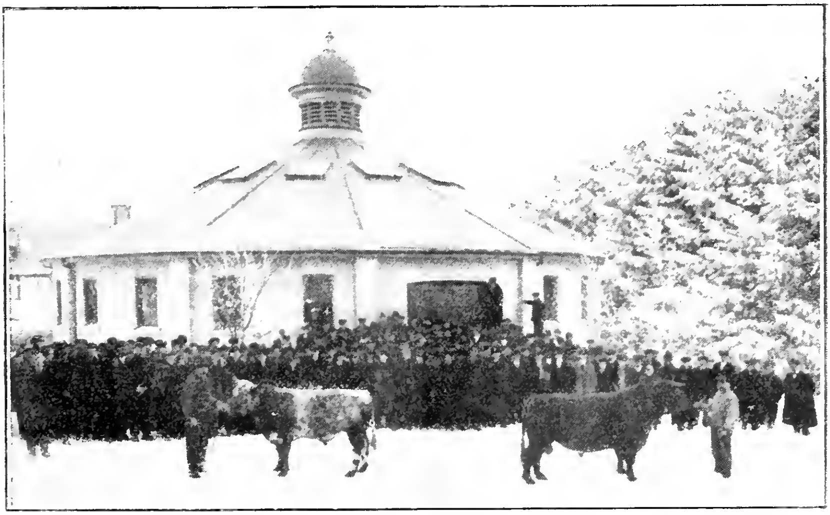
Saskatchewan is the principal grain-producing province of the Dominion. In 1917, 263,000,000 bushels of wheat, barley, oats, rye, and flax were produced in Saskatchewan, of which 130,000,000 bushels was wheat. Saskatchewan leads the way in the number of elevators and capacity; 710 railway stations had 1,782 elevators, with a capacity of 52,943,000 bushels. Each small railway station has from three to seven elevators, according to the amount of business transacted. In many cases these are owned by private companies. In other cases farmers' co-operative organizations control the elevators. In western Canada, elevators

are provided at 1,300 centres. The elevator capacity, including the terminal at Fort William and Port Arthur, is 164,899,333 bushels.

Saskatchewan's average wheat yield for six years was 18 bushels per acre. The province has produced nearly 800,000,000 bushels of wheat in the past seven years—a fine tribute to the fertility of the soil.

There are drawbacks, however, even in the prairies. The temperatures fall far below freezing during the winter months, and a system of heating the homestead is essential on every prairie farm. Then the prairies give one the impression of great loneliness—unending flat stretches, practically treeless, and situated at least 1,000 miles from either the Pacific or the Atlantic seaboard.

The prairies are essentially great grain fields. Live stock have not made their appearance in any considerable numbers. In Saskatchewan, for example, despite the enormous production of grain in 1917, there were only 2,801,593 head of all forms of stock—horses, cattle, sheep, and pigs.



Group of Farmers attending short courses on Stock Judging and Cattle Feeding—Ontario Agricultural College, Guelph, Canada.

Still, the Saskatchewan farmer will tell you he is doing well. In 1917 the total value of production for Saskatchewan was £80,000,000 for a total population of 687,000 people; an average production per inhabitant of £123. The Saskatchewan people have acquired the habit of asking strangers where can such production be equalled on this globe? The only retort left the wondering visitor is that one deserves to be recompensed for the rigorous winters and the loneliness of the prairie.

The grain crops of the prairies are, of course, handled in bulk. No other system of handling would suffice to deal with the enormous volume of grain traffic. Wheat, barley, oats, and even flax are handled alike.

In Southern Alberta irrigation has developed rather rapidly. The rivers from the Rocky Mountains have been harnessed, and the water diverted to the fertile plains below.

The Canadian Pacific Railway Company has constructed 5,000 miles of irrigation canals, and have an irrigable acreage of 643,000 acres. The cost of their irrigation works exceeds £2,000,000.

The Alberta Irrigation Company has 130,000 acres of irrigable land, on which it has spent £300,000.

The Southern Alberta Land Company, with a capital of £1,100,000, is providing facilities for irrigating 153,000 acres. These are the three principal land companies operating irrigation enterprises.

The Canadian Pacific Railway Company conducts a large experimental farm and several branch demonstration farms to carry out irrigation investigations for the information of its settlers.

A few words regarding Canada's total production may be of interest. In 1916 the following crops were produced:—

	Bushels.
Oats	410,000,000
Wheat	262,000,000
Barley	42,000,000
Potatoes	63,000,000
Flax	8,250,000
Buckwheat	6,000,000
	Tons.
Hay	14,500,000

There were 38,000,000 acres under crop in 1916. It is interesting to note the large amount of oats produced, compared with other cereals. The flax-seed crop, too, is worthy of note. Flax is widely grown on the prairies, and does particularly well on new land. It is cultivated throughout the wheat areas, and is treated much like the wheat crop. While in crop production Canada greatly exceeds Australia, Australia has the advantage in live-stock production. The number of live stock in Canada in 1916 was as follow:—

Cattle	8,000,000
Pigs	3,619,000
Horses	3,412,000
Sheep	2,369,000

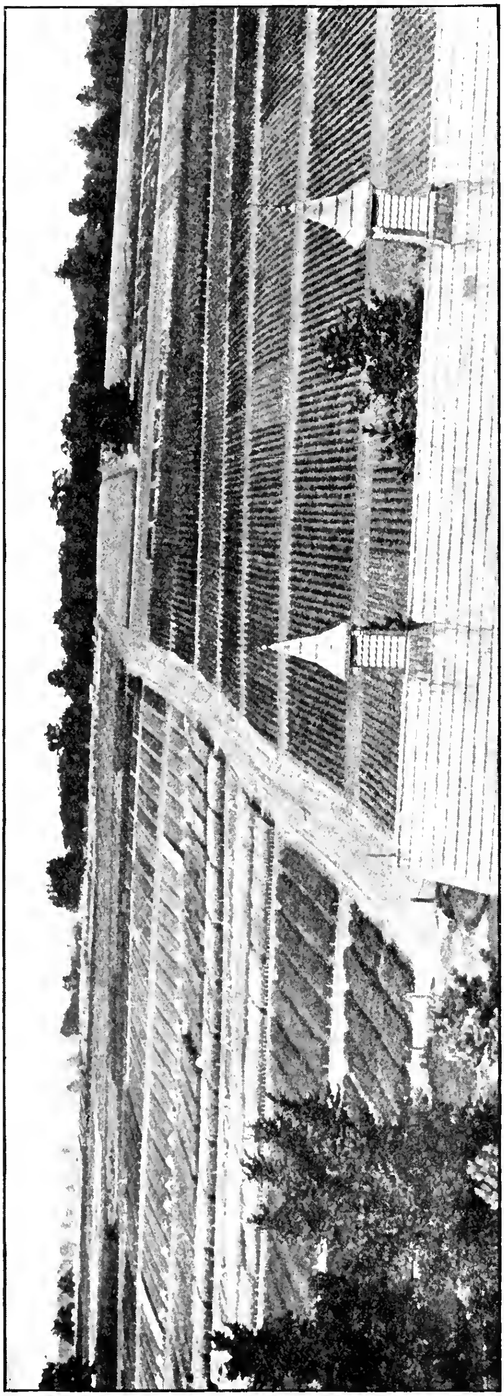
In Australia the number of live stock in 1915 was as follow:—

Sheep	69,257,189
Cattle	9,931,416
Horses	2,377,920
Pigs	753,693

AGRICULTURAL EDUCATION IN QUEBEC AND ONTARIO.

Under the *British North America Act* 1867 legislation regarding education was left exclusively to the provinces, subject, however, to the maintenance of privileges of such separate schools as existed at the time of Federation. Under this Act Quebec, which was overwhelmingly French-speaking and Roman Catholic, continued to give instruction in French, and under the control of the Church.

Apart from this, it may be said that a common type of education is being developed from one side of the Dominion to the other. This is owing to the fact that the settlers who went first to the West were Canadians, and carried with them to the West the institutions of the East. As in



View of Cereal Experiment Field, Ontario Agricultural College.
(The experiments comprise exhaustive tests with wheat, barley, oats, rye, flax, potatoes, lucerne, mangolds, grasses, and fodder plants.)

America, the elementary and high schools are all maintained by the local school district. There is no centralized system of school control such as we have in Australia.

The majority of the funds required for equipment and maintenance of the elementary and high schools is raised by local effort. The provincial Governments, however, make small contributions by grants in aid.

The Agricultural Colleges of the Dominion have been founded, however, almost entirely by State aid. For many years the only agricultural college in Canada was the Ontario Agricultural College, founded at Guelph in 1874. Now there is an agricultural college in every province, and in nearly every case it is part of the State University.

The newer prairie provinces—Manitoba, Alberta, Saskatchewan—have built magnificent agricultural colleges as part of the State University.

In Quebec there are three agricultural colleges. They are the Oka Agricultural Institute, the College at St. Anne de la Pocatiere, and the Macdonald College at St. Anne de Bellevue. The two former are Roman Catholic Colleges, and are affiliated with Laval University, Montreal. The latter, Macdonald College, is controlled by the Board of Governors

of McGill University, Montreal. It gives a four-year course for the degree of B.S.A.

I visited the Oka Agricultural Institute and the Macdonald College, Quebec. The Oka Institute is controlled by the Order of Trappist Monks—a curious brotherhood—the laymen of which have to take the vow of eternal silence.

The institute has a large area of land, and recently the Government of Quebec erected a four-story building capable of accommodating 200 students. Over 150 students were taking a four-year course of agriculture for the degree. The working monks (120), in their quaint mediæval robes, with a sprinkling of "fathers" with white hoods, and the towering monastry in the background, made a curious setting for an agricultural college. There was very little experimental and research work undertaken at the Institute. The work in the poultry and horticultural departments, however, was decidedly good.

At Macdonald College may be seen one of the finest groups of buildings, and one of the best laid-out colleges in North America. It is but

View of Buildings, Ontario College of Agriculture, Guelph, Canada.

ten years old, and is destined to play an important part in the agricultural development of Eastern Canada. The College was founded, erected, equipped, and endowed by Sir William Macdonald, a wealthy merchant of Montreal, at a cost of £1,500,000, for advancement and dissemination of knowledge with special reference to the needs of the rural population. The property consists of 700 acres of good farming land, 20 miles from Montreal. It has within it three schools—

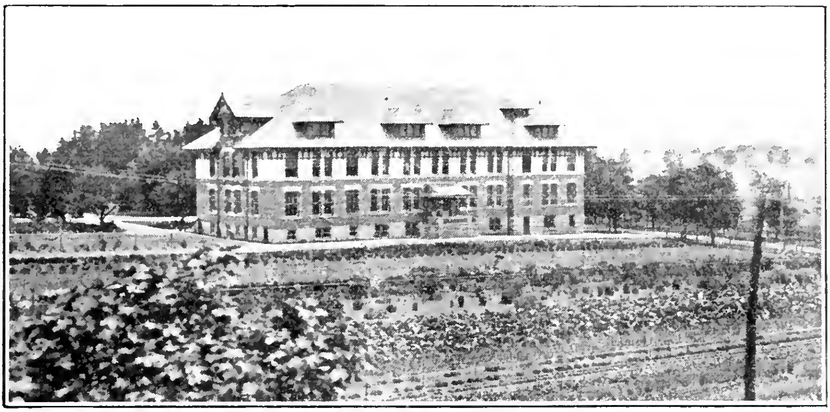
1. School of Agriculture.
2. School for Teachers.
3. School for Household Science.

The staff consists of 24 professors and lecturers in agriculture, ten in the school for teachers, and six in the school of household science.

Two courses are provided, a two-year course, very practical in character, and specially arranged to meet the needs of farmers' sons who purpose returning to the farm, and a four-year course for the degree of B.S.A.

The courses for the first three years are rigid and fixed. In the fourth year the student has choice of four courses:—(1) Animal husbandry; (2) cereal husbandry; (3) horticulture; (4) general agriculture. The average attendance in the regular courses are—Agriculture, 180; teachers' course, 160; household science, 80. The students taking the four-year course must be eighteen, have matriculated at McGill, and must have worked on a farm for a year. A considerable amount of experimental work in horticulture, stock feeding, production of new varieties of cereals, and vegetable gardening is being undertaken. The total cost of maintenance of the college is over £40,000 per annum.

Ontario.—The Ontario Agricultural College is located at Guelph. It is under the direction of the Department of Agriculture of Ontario. The Guelph College is the oldest college in Canada, and is one of the first agricultural colleges established in North America. For many years Guelph had a chequered career. As recently as 1903 the farmers



Cereal Husbandry Building, Ontario Agricultural College, Guelph, Canada.

would not support it liberally with funds. In 1905 the college was reorganized, the standards of instruction raised, and a system of extension work was commenced for the benefit of the farming community. The result has been little short of miraculous. To-day the college has the enthusiastic support of the farming community, the Provincial Government, and the Dominion Government. It receives over £60,000 for salaries and maintenance from the State Government, and last year it received over £20,000 from the Federal Government. The remarkable change in the attitude of the farming community and the public during the last twelve years has been due to the gradual recognition of the sterling worth of the institution, and of its capacity for service to the agricultural community. This recognition has been hastened by three things—(*a*) Government financial support, which has given the college an opportunity to secure a staff of capable specialists in all branches of agriculture and animal husbandry; (*b*) the policy of holding numerous short courses in the winter months, so that farmers may get in touch with the college men, and appreciate the worth of their teaching; (*c*)

the results of the experimental work by members of the staff—particularly Dr. C. A. Zavitz, who, by patient experimentation and research over a period of 35 years, has produced varieties of oats and barley which have practically supplanted all others in Ontario. He has also obtained from his permanent experimental plots results which are influencing the method of cultivation of every type of farm crop in Ontario.

During the past winter thirteen short courses, ranging from two weeks to three months, were conducted at Guelph. These included courses on stock and seed judging, poultry raising, horticulture, cow testing, farm dairying, cheese making, beekeeping, drainage and farm surveying, business and marketing.

Some idea of the nature of the experimental work may be gained from the fact that over 2,500 plots, exclusive of small plant-breeding plots, were harvested separately, and exact records of grain and straw production were obtained. The illustration on page 581 gives a view of experimental plots.

In addition, there are two courses on agriculture, each of five weeks' duration, for elementary and high school teachers. These are held every year. The courses begin to-day, and the enrolment was 320. These short courses are very technical and practical. The attendance at Ontario Agricultural College has been greatly reduced by the war, and many of the men in the upper classes have been drafted. Still, here are the attendances for 1918:—

Regular course in agriculture	197
Courses in domestic science	176
Courses for public school teachers	265
Short courses—	
Farm power	154
Seed and stock judging	137
Horticulture	57
Dairying	56
Agriculture	46
Rural leadership	114
Poultry	31
Drainage	13
Total	1,246

In addition, several thousand farmers visited the college in January to see the results of the experimental plots of Dr. Zavitz. As at Macdonald, and at nearly all American Agricultural Colleges, there is a course on domestic science and household arts maintained at Guelph. The theory is that you can't keep the man on the farm unless you can keep his wife on the farm, too. That is the reason why we find 176 girls and women, from seventeen upward, coming to the college to learn how to make a farm home comfortable, and how, by labour-saving devices, to minimize drudgery in the farm home, and make it a place worth living in. Neither at Macdonald nor at Guelph, however, have they progressed as far as the colleges in the United States. Here four-year courses in domestic science are given, and the girls get a sufficient grounding in the sciences and applied arts at the universities to warrant

a B.S.C. degree being given. Even universities of such high standing as Cornell, Columbia, and Illinois have big schools of domestic science, and give a B.S.C. degree. It is related that Dr. Schurman, president of Cornell, when the first proposal to introduce a domestic science course at Cornell was mooted, exclaimed at a faculty meeting, "What! Does that mean that we must have cooks on the faculty?" But Dr. Schurman and others now recognise the wonderful work which is being done by domestic science graduates in improving farm homes, in promoting community betterment, and in saving infant life by the dissemination of the principles of hygiene. The buildings and equipment at Guelph are very fine—and the campus reminds one of a corner in the Melbourne Botanic Gardens.

The regular courses in agriculture at Guelph are interesting. A two-year course for an Associate Diploma, and a four-year course for the degree of B.S.A. of Toronto University, are given. The first two years are alike in both courses, and the objective is to give the student as much technical knowledge of agriculture as possible, combined with English and science work.

In the third year the subjects are almost entirely science subjects. In the fourth year the students specialize in one of six branches:—(1) Agriculture; (2) Bacteriology; (3) Biology; (4) Chemistry and Physics; (5) Horticulture; (6) Dairying.

There are many interesting features regarding Guelph College which I should like to deal with, especially Dr. Zavitz's experimental work—but I shall reserve these details for a later occasion. The college is doing fine work, and compares favorably with the American Agricultural Colleges.

THE DEPARTMENTS OF AGRICULTURE.

The Dominion Department of Agriculture.

The Federal Government has established a large and influential Department of Agriculture, which disburses annually considerably over £1,000,000. Each province has a Provincial Department of Agriculture, with rather considerable powers. There is a marked difference in the manner in which the agricultural forces of Canada and the United States are organized. In the United States practically all the educational, investigational, and extension work in agriculture is carried out by the Agricultural College and the University, and to the State Departments of Agriculture are intrusted the purely regulatory activities in agriculture, such as the control of diseases in stock, crops, &c.

The reason is probably found in the organization of the States. Under the American Constitution, the Governor of a State is elected by the people for a term of four years, and once elected he administers the State laws through executive officers, whom he nominates. There is no Cabinet of Ministers responsible to Parliament, as we have in Australia. Consequently, such activities as are included in research, instruction, and extension work in agriculture has in the States been handed over to a stable form of administration—the Agricultural College—which is responsible to the people in the Legislature in so far as it is dependent on Parliament for supply. The other functions of a State Department, inspectional police work, and regulatory activities have remained with

the State in the temporary charge of the nominee of the Governor. In Canada the British and Australian practice is followed. Both the Dominion Government and the various Provincial Governments have a Cabinet of Ministers, who hold office as long as they can retain a majority in Parliament. The Ministers, therefore, must frame a policy, and as agriculture is the basis of the country's wealth, vigorous policies for developing the agricultural resources have frequently been brought forward, and large Departments of Agriculture have arisen to carry out these policies.

First, as regards the Dominion Department of Agriculture. The expenditure for 1916-17 was approximately £1,100,000, made up as follows:—

Salaries	£108,000
Maintenance	770,000
Expenditure under the Agricultural Instruction Act	230,000
Contingencies	20,000
	£1,128,000

This is a very considerable sum to be disbursed by a Federal Government on agriculture for a population of approximately 8,000,000 people.

In addition to this, each province maintains a Provincial Department of Agriculture. Ontario voted £190,000 for its Department of Agriculture this year.

One interesting item in the Federal appropriation is the Agricultural Instruction Act, $1,100,000 (£230,000). This Act was passed in 1913. It established the principle of *Federal aid in agricultural education and instruction in Canada*—

> "For the purpose of advancing the farming industry by instruction in agriculture, and for the purposes authorized by the Act, the sum of $10,000,000 (£2,080,000) shall be appropriated and paid out of the Consolidated Revenue for ten years beginning in March, 1914.
>
> Seven hundred thousand dollars (£145,000) to be paid in 1914, rising to $1,100,000 (£230,000) annually in 1918, and thereafter. The money is to be apportioned as follows:—
>
> (1) A sum not exceeding $20,000 (£4,000) per annum, be voted to assist the work of veterinary colleges established in provinces.
>
> (2) Twenty thousand dollars (£4,000) to be paid to the Government of each province.
>
> (3) The balance to be allotted and paid to the Governments of the provinces in the proportion of the populations of the province at the last census. The payments to be made subject to an agreement between the Minister and the Government of the province as to the terms, conditions, and purposes."

Such are the main features of a statesman-like Act, which promises to put new life into agricultural education in Canada.

The framers of the Act were of the opinion that education and instruction for the farming community might best be classified under four heads:—

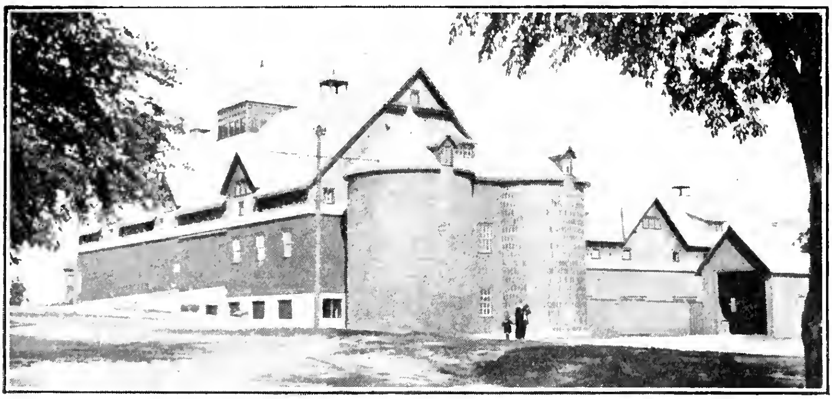
(1) The teaching in the public school of the first principles of the sciences related to agriculture.

(2) The teaching of more advanced agriculture in the agricultural colleges and universities designed more particularly to train teacher investigators and community leaders.

(3) The carrying on of extension work involving the instruction of farmers by making them familiar with the results of scientific investigation and research.

(4) The amelioration of the conditions of rural life, particularly so far as women and children are concerned.

The effects of the Act are already manifest. In some provinces no agricultural instruction worthy of the name was carried out prior to the passing of the Act. Now agricultural investigation, teaching, and extension work in every province has been given new life.



View of Dairy Buildings and Silos—Dominion Experiment Farm, Ottawa, Canada.

Dominion Experiment Farms.

The most important branch of the Federal Department of Agriculture is the system of Dominion experiment farms.

These were established under the *Experiment Stations Act* 1886. At the present time there is a central experiment station at Ottawa, on which the greater part of the investigational work is done, and 22 branch stations in the various provinces of the Dominion.

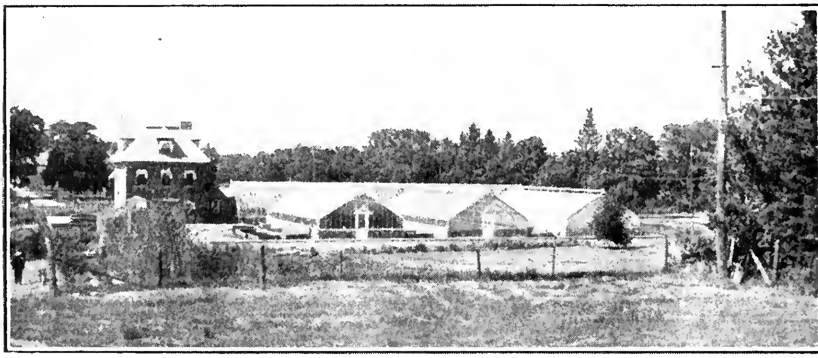
The vote for the Dominion experiment farms, for maintenance (exclusive of salaries, &c., on the civil list) is over £200,000 for the fiscal year of 1918.

The function of these stations is twofold:—

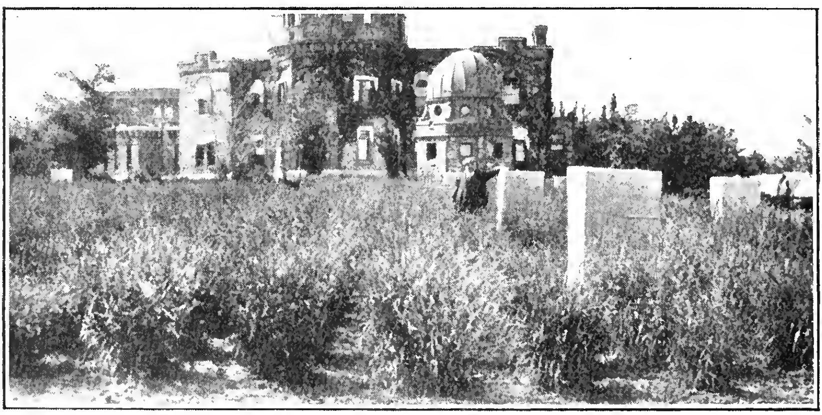
(1) Investigational and experimental work—the discovery of new facts and new knowledge in the field of agriculture, horticulture, and animal husbandry. (2) The dessemination of agricultural information amongst the farming community by bulletins, press notices, demonstrations, and by co-operation with the various provincial departments.

The work of the farms has included experiments and studies relating to the breeding and feeding of live stock, the production of butter and cheese, field crops, natural and artificial fertilizers, cereals, grasses, forage plants, trees, plant diseases and injurious insects.

The more strictly scientific side of the work is carried out at the Central Farm at Ottawa, and is organized in thirteen divisions:—(1) Field husbandry; (2) annual husbandry; (3) horticulture; (4) cereals; (5) chemistry; (6) forage plants; (7) botany; (8) poultry; (9) tobacco;



View of Horticultural Department, Dominion Experiment Farm, Guelph, Canada.



Breeding resistant varieties of timothy at the Dominion Experimental Farm, Ottawa.

(Note contrast in the different strains of timothy.)

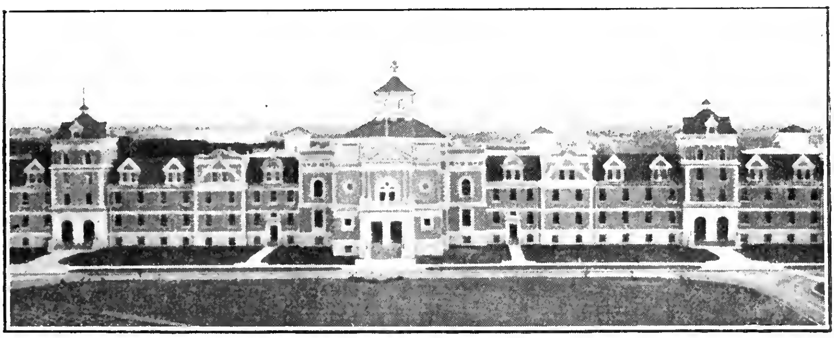
(10) economic fibre; (11) illustration stations; (12) apiculture; (13) extension and publicity.

It is impossible to mention in detail the many important results obtained by these experiment farms. Suffice it to say that through them Canada is in possession of a body of exact knowledge of all branches of agricultural industry, accumulated and tested in each climatic division of the Dominion for a period of thirty years. Such knowledge, specific in character, enables Canadian farmers to follow practices demonstrably certain to lead to an increased output.

Of the more outstanding results might be mentioned the work of the Cereal Division. The late Dr. Saunders, Plant Breeder and Dominion Director of Experiment Farms, evolved new varieties of grain possessing productiveness, early ripening habit, and good baking strength.

Preston, Huron, and Stanley are all vigorous, early-maturing, and prolific wheats, and have enabled the wheat belt to be pushed further north; but the variety that has achieved the greatest success is Marquis wheat, which is equal to the old Redfife in baking qualities, ripens five to ten days earlier, and is superior in productiveness to any other grown in the Dominion.

In the United States wheat belt, I found this wheat extensively grown, and officers of the United States Department assured me that the introduction of Marquis wheat has added tens of millions of bushels of wheat to the harvest of America, to say nothing of Canada. Marquis has done even more for Canada than Farrer's Federation did for the wheat belt of Australia, and Australian farmers know how indebted they are for Federation wheat.



Group of Buildings, Manitoba Agricultural College, Winnipeg, Canada.

New varieties of fruits, particularly apples and pears, have been evolved by cross-breeding by the Dominion Horticulturist (Mr. Maconn), which have proved themselves more resistant to cold than any now being grown. Such work is of great moment in a country where winter cold is the limiting factor for tree growth.

Remarkable results have been obtained, too, in breeding hardy strains of grasses and forage plants.

A recent development has been the creation of an economic fibre division, which, with equipment for retting, breaking, scutching, and working up fibres, tests the value of fibres grown throughout the Dominion.

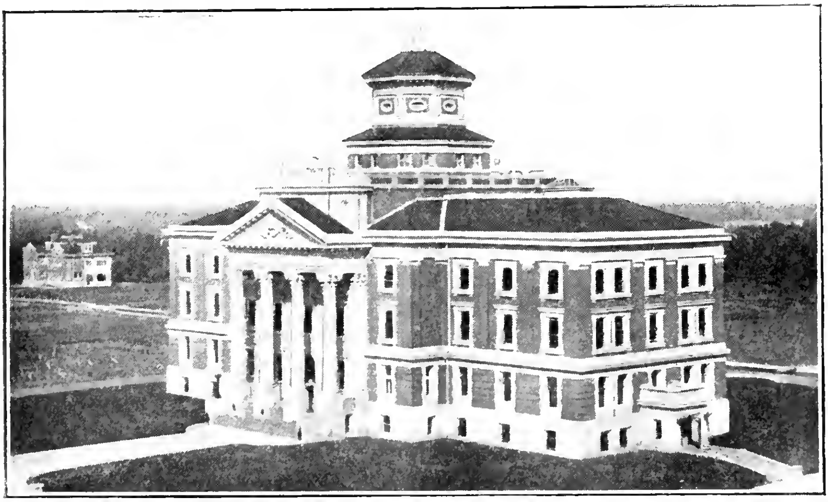
During my stay at the Central Farm at Ottawa a Farmers' Field Day was held, and, despite the inclement weather, over 600 farmers attended the various demonstrations.

Other important branches of the Federal Department which I investigated were:—

(1) Live-stock division, appropriation ..	£125,000
(2) Health of animals division, appropriation	86,000
(3) Pure seeds branch, appropriation ..	35,000

(4) Entomology and administration of Destructive Insects Act, appropriation	..	30,000
(5) Dairy division, appropriation ..	..	32,000
(6) Fruit division, appropriation ..	..	25,000

The Provincial Departments of Agriculture are maintained in addition to those of the Federal Government, but the advantages the Federal Experiment Stations have is that they are under one control, and the tests made at the Central Farm can be duplicated and tested out at each at the twenty-two branch stations. The officers of the Federal Department naturally, therefore, learn to take a broader and more comprehensive view of agricultural problems, and are able to plan work of nation-wide application.



Administrative Building, Manitoba Agricultural College, Winnipeg, Canada.

THE ONTARIO DEPARTMENT OF AGRICULTURE.

The Ontario Department of Agriculture is located at Toronto. Its permanent head is called the Deputy Minister of Agriculture. The main activities of the Department are:—

1. District Representatives—corresponding to the county agents of the United States.

Ontario was the first province in the Dominion to adopt the District Representative plan of organizing the extension activities of the State. In 1907, the Ontario Government appointed specialists in agriculture—graduates of the agricultural college—to six of the important agricultural districts of the province. To-day there are forty-seven specialists appointed as District Representatives, one in each county of the province. The salaries of these men range from £310 to £420 per annum, plus travelling expenses.

The Provincial Government pays the salary of the District Representative and the remainder of the office expenses. In the United States the counties contribute from £300 to £500 towards the expense of the county agent. The work of the District Representative is similar to

that of the county agent in the United States. No representative is put into a district until the farmers ask for it and the County Council agrees to put up 500 dols. per annum for expenses. As forty-seven counties out of sixty-eight in Ontario have county representatives, it indicates that good work has been done by this organization. The main purpose of the District Representative's office is to act as a clearing house for the dissemination of agricultural information. He attends as many meetings of farmers' societies, gets to know their needs and endeavours to supply their wants. This year there has been a tractor drive in Ontario, and 155 tractors have been placed on farms during the past three months. The Dominion Government bought 1,000 of these tractors and allocated 200 to the Ontario Government.

Each District Representative conducts short courses in agriculture for farmers' sons. The courses extend over four weeks. The representative attends all the farmers' clubs in the county, assists in giving demonstrations on farms throughout the county.

I visited one of the county agents at Brampton. He had just put on a "Save the baby campaign." He had arranged with the four local doctors to hold a free Baby Clinic for two days. The mothers brought their babies and children up to three years of age to the town for free medical inspection and examination. The death rate for infants in Ontario is 104 per 1,000. As a result of the free clinic over 300 babies were brought into the medical officers during the two days. I visited the clinic at the end of the second day. There was a large hall filled with interesting exhibits on the management and feeding of infants, prepared by the Health and Medical Departments of the Government, and demonstrations were given by competent nurses and science teachers on the preparation and types of food for infants and young children. Then there were some interesting educational work in the hall. "Being a baby is a dangerous business. A soldier in France is safer than a baby in Brampton." "A new-born baby has less chance of living a year than a man of eighty." Such were the types of placards bringing under the notice of the people the high infantile mortality in Ontario.

An amusing model was an automatic procession of babies bearing on their backs signs such as the following:—

"We want sensible mothers."
"We want good water."
"We want pure milk."
"We want fathers who think."—&c.

In chatting with the local doctors I found that many of the children were suffering from preventable ailments. One doctor said 90 per cent. of these cases would not come before them except at a free clinic, such as this.

Of course a "Baby Clinic" has not much to do with agriculture. but if the saving of a horse is worth, say, £50, what is the saving of a future farmer of Ontario worth? Figure it out, and I think you will find that the good done by that Baby Clinic would be sufficient to pay the cost of the salary of that enterprising District Representative many times over. It was a novel "stunt," and made possible by the co-operation of the Agricultural and Public Department and the local doctors.

(To be continued.)

COPPER FUNGICIDES FOR VINE DISEASES.

By F. de Castella, Government Viticulturist.

Fungicides are either preventive or curative. The latter can only be used with success for the control of fungi, the mycelium of which is external to the tissues of the plant, such as Oidium, or Powdery Mildew of the vine (*Uncinula spiralis*), against which sulphur dustings are the standard remedy, whilst spraying with weak solutions of potash permanganate, liver of sulphur, &c., give good results in colder weather. In the case of most fungi, and more particularly Downy Mildew and Black Spot of the vine, the mycelium develops in the interior of the tissues of the plant. These can only be controlled by preventive treatment; the entry of the fungus into the tissue of the plant must be rendered impossible by spraying with some fungus poison in such quantity that every rain or dew drop may dissolve sufficient of it to prevent the germination of any fungus spore which may fall into it. In other words, prevention of spore germination protects the tissues of the vine from infection.

Many fungus poisons have been suggested, among which silver, mercury, cadmium, and alkaline polysulphides (lime-sulphur, &c.) may be mentioned; but copper has so far proved the most efficacious, and is to-day by far the most widely used of preventive fungicides. Copper may be employed for this purpose in various forms, each of which has its advocates; the oldest copper fungicide is undoubtedly Bordeaux Mixture or Copper-Lime, which is still the best known and most widely used. It is, therefore, the form which must first be considered; subsequently, some of the substitutes which from time to time have been proposed, and more or less extensively used, will be described. The most important of these is copper-soda or Burgundy Mixture, which is well known to most of our orchardists and potato-growers. Though an excellent fungicide, present-day difficulties in the way of procuring the carbonate of soda necessary for its preparation deprive it of much of its importance. In spite of its undoubted qualities, it is in no wise superior to Bordeaux Mixture; there are, indeed, sound reasons for preferring the latter, as will be shown subsequently.*

Bordeaux Mixture.

The origin of this standard fungicide may be briefly stated. In many vineyards in the Bordeaux district of France, where fences or walls are often absent, it has long been customary to sprinkle the outer rows fringing the roads with a mixture of lime and bluestone, in order to protect the fruit from marauders. The resultant pale blue markings of the foliage serving the same purpose as a notice "Poison laid here." When Downy Mildew first ravaged the vineyards of France in the early eighties of last century, it was soon noticed that these outer rows suffered far less from the disease than vines which were not so treated. Thus was discovered, quite accidentally, the efficacy of copper for the control of Mildew and other fungi.

* The main reasons for preferring "Bordeaux" are that it adheres better, is less depressing on vegetation and burns the foliage less. It also deteriorates much less rapidly after mixing. In warm weather the precipitate of copper-soda soon becomes granular and loses its power of adherence.

From the first haphazard sprinklings to the methodical use of logically-prepared *Bouillie bordelaise* (literally Bordeaux pap) or Bordeaux Mixture, was a simple evolution carried out by French vine-growers under the guidance of Millardet and other scientists. It is indeed strange that French viticulture should thus, at the very beginning of the fight against Mildew, have had the good fortune to accidentally hit upon the copper fungicide, which is still the most efficient and generally useful, and which has not been displaced as first favorite after nearly 40 years of experimentation.

Bordeaux Mixture fills all the requirements of a perfect fungicide. An entirely soluble substance would be washed off by the first heavy shower; its application would need constant renewal in a wet season. The precipitate of Bordeaux Mixture, however, is practically insoluble, though not entirely so. Part of it is slightly soluble, and under the action of the carbonic acid of the air further portions are gradually rendered more or less soluble, so that the "reserve of copper" which adheres to the green organs of the vine after a spraying continuously makes available quantities of soluble fungus poison, minute it is true, but sufficient to prevent spore germination. It is held by most authorities that two to three parts of copper sulphate in 10,000,000 parts of water is sufficient to inhibit the germination of Mildew spores.

The sediment of Bordeaux Mixture also possesses considerable power of adherence; this is sufficient to resist, in a marked degree, its removal by rain. Once it has been allowed to dry on the vine, it is only after continuous and violent rains that the spray substance is washed off; storm showers are far more potent in this respect that light, misty rain.

The nature of the precipitate, its solubility, and its power of adherence vary considerably according to the method of preparation, and in a certain measure to the presence of some substances which may be added. It follows that several modifications have from time to time been made in the mode of preparation, and there are at the present time numerous distinct recipes in practical use.

The formula first recommended by Professor Millardet in 1885 was very strong; it contained 8 per cent. of copper sulphate and 15 per cent. quicklime (40 lbs. copper sulphate and 75 lbs. quicklime to 50 gallons of water). It was soon found that a much weaker mixture afforded almost equal protection. The proportion of copper sulphate was first reduced to 3 per cent., and later to 2 and even to 1 per cent., the quantity of lime being even more considerably reduced, only sufficient of this last substance being employed to neutralize the acidity of the copper sulphate as shown by test papers.

What may be termed Standard Bordeaux Mixture, which has for some years past been recommended in the majority of French viticultural hand-books, consists of 2 per cent. copper sulphate crystals and 1 per cent. quicklime of good quality. In other words, 2 lbs. of copper sulphate and 1 lb. quicklime to every 10 gallons of water. The copper sulphate is dissolved in about 8 gallons of water; the lime is slacked and made into a milk in one gallon of water. The latter is poured into the former—on no account should this order be reversed—with constant stirring, and the bulk make up to 10 gallons by the addition of a little water. Since lime varies greatly in purity, it is generally recommended to be guided by test paper rather than by the weight of lime

used, and to cease adding the milk of lime as soon as the paper shows the first signs of an alkaline reaction. If the lime be of poor quality, more than one pound may be required to neutralize 2 lbs. of copper sulphate; with chemically pure lime, considerably less than one pound would be required. The proportion of lime required thus varies greatly according to its quality. Quicklime changes rapidly on exposure to air; it first becomes slacked, and subsequently carbonated. 100 lbs. of pure quicklime after becoming slacked would weigh 135 lbs.; when completely carbonated it would weigh 178.6 lbs. Air-slacked lime, provided it be not carbonated, is just as suitable as quicklime, though more of it must be used. Once lime has become carbonated it is no longer fit for the preparation of Bordeaux Mixture; with it, the chemical reactions which take place are different, and the precipitate varies considerably in its nature. Amongst other substances, it contains carbonate of copper, a substance which has a severe action on the green tissues of the vine. Hence it is that Bordeaux Mixture prepared with faulty lime (too old), even if this be used in the proportion shown to be necessary by test paper, often burns the foliage of the vine.

In France, all authorities are agreed that 2 per cent. of copper sulphate crystals is the standard strength for Bordeaux Mixture; it is considered unsafe to place reliance on anything weaker, especially in the case of severe Mildew outbreaks. The recent high price of copper has led to weaker mixtures having been somewhat largely applied during the past couple of years in France. Though satisfactory protection has sometimes been obtained with 1½ per cent., and even with 1 per cent. Bordeaux, the results of a reduction in strength have often led to grave disappointment. Indeed, in the disastrous Mildew visitations of 1910 and 1915 in France, an increase of the copper sulphate strength to 3 per cent. was often recommended and applied with most satisfactory results. If the copper percentage be reduced below the standard mentioned above, the duration of protection is correspondingly reduced. With the standard strength, the vine is provided with a "reserve of copper" such that, even though fairly heavy rain may fall, sufficient remains on the green organs to prevent spore germination and consequent infection.

Chemistry of Bordeaux Mixture.

This is not nearly so simple as was formerly thought. In many of the older text books the reaction which takes place when lime is added to copper sulphate solution is stated to be as follows:—

$$\underset{\text{(Copper Sulphate)}}{CuSO_4} + \underset{\text{(Lime Hydroxide)}}{Ca(OH)_2} = \underset{\text{(Lime Sulphate)}}{CaSO_4} + \underset{\text{(Copper Hydroxide)}}{Cu(OH)_2}$$

According to this, the lime and copper merely change places. In reality the transformations which occur are far more complex.

When lime is added to copper sulphate solution both substances undergo change; the lime takes part of the sulphuric acid from the copper sulphate to form lime sulphate or gypsum, but so long as the lime is not in excess there is no copper hydroxide formed. The precipitate consists of copper in the shape of basic sulphates—in other words insoluble sulphates of copper which contain more of the metal than ordinary copper sulphate (bluestone). The greater the amount of

lime added the higher the basicity of the copper sulphate which is precipitated. Sulphate of lime is, of course, also precipitated, but being an inert substance it need not be taken into consideration.

If one takes a solution of 10 lbs. copper sulphate in 50 gallons of water, for example, and lime milk be added progressively, basic sulphates will be precipitated, with compositions approximately as follows:—*

$3.5CuO, SO_3$—so long as the quantity of lime is less than 1.685 lbs.
$4CUO, SO_3$ Tetracupric sulphate—when the quantity of lime used reaches 1.685 lbs.
$5CuO, SO_3$ Pentacupric sulphate—with 1.8 lbs. lime.
$10CuO, SO_3$ Decacupric sulphate—with 2.02 lbs. lime.
$5CuO, CaO, SO_3$ Double sulphate of copper and lime—with 2.25 lbs. lime.

If the quantity of lime be still further increased, double sulphates of lime and copper are formed richer in lime than the one mentioned above; finally, double hydrates of copper and lime make their appearance.

These salts are not precipitated in a state of purity for each quantity of lime used; it is really a mixture of several of them, the one which predominates being as set out above.

To Pickering† is due the credit of having first investigated the chemistry of Bordeaux Mixture. More recent French investigators are in agreement with his conclusions, so far as the composition of the different substances contained in the final mixture is concerned; as regards the fungicide value of each, or rather their preventive power, there is less concordance. Pickering was of opinion that Tetracupric sulphate is the most valuable of the different basic copper sulphates, and that every endeavour should be made to obtain a precipitate in which this salt would predominate. This would mean a slightly acid mixture; in practice Bordeaux Mixture is nearly always alkaline.

He recommended Woburn or Lime-water Bordeaux, made with lime water instead of milk of lime. Owing to the slight solubility of lime, Bordeaux made in this way must necessarily be far weaker in copper than the standard 2 per cent. strength. Pickering held that, owing to the greater efficacy of Tetracupric sulphate, the weaker mixture would have equal fungicide power to Bordeaux prepared in the usual way, a contention which has not been borne out in practice. Lime-water Bordeaux, after extensive trial, has been found very inferior to 2 per cent. Bordeaux made with milk of lime; its use cannot, therefore, be recommended.‡

It is true that what is called Woburn Paste has been placed on the market in England. This consists largely of Tetricupric sulphate, and merely requires mixing with water before use; it can therefore be used in any strength desired. Though a good fungicide, it does not appear superior in any way to ordinary Bordeaux. The greater solubility of Terticupric sulphate seems to be a defect rather than an advantage;

* L. Sicard—*Progres Agricole*, 20th September, 1914.

* See reports of the Woburn Experimental Fruit Farm (8th-11th) by the Duke of Bedford and Spencer U. Pickering.

‡ It has even been recommended to reduce the proportion of copper sulphate as low as 10 ozs. to 50 gallons of spray mixture. See article on "Lime-water Bordeaux" in *Journal* for November, 1910, by Mr. D. McAlpine.

though perhaps more active at first, it is removed by heavy rain sooner than the precipitate of ordinary Bordeaux, thus rendering the duration of its protection insufficient.

Bordeaux Mixture may thus be acid, neutral, or alkaline. Copper sulphate is an acid salt. Its acidity may be neutralized by various substances; in the case of "Bordeaux" lime is the alkali used. If chemically pure quicklime (slaked and made into a milk with water) be progressively added to a solution of copper sulphate it will be found that if 10 pounds of copper sulphate are present in the solution this will maintain its acid reaction until 1.685 lbs. of lime have been added. At this point the mixture becomes neutral. If the addition of lime be continued, it will not be until the total quantity of pure lime reaches 2.25 lbs. that the mixture shows an alkaline reaction. It is thus evident that a neutral mixture is obtained by using quantities of lime varying between these two limits. It is really the nature of the precipitate which differs; the nearer the quantity of lime used approaches to the figure 2.25 lbs. the greater the basicity of the precipitate. If more than 2.25 lbs. of lime are employed an alkaline "Bordeaux" will be obtained.

It is thus evident that the standard Bordeaux Mixture used in France, viz., half as much quicklime as bluestone, must, with lime of anything like good quality, always result in an alkaline mixture. Even when the quantity of lime is gauged by test paper instead of by weighing, the resulting mixture will inevitably be alkaline, for the reason that milk of lime is a mixture of solid particles with water, and not a true solution. Even with thorough stirring the action of the lime takes time; each minute grain becomes surrounded by a vesicle or bladder of basic copper sulphates, lime sulphate, &c., with a result that the lime continues its action for some considerable time after the test paper indicates the first signs of alkalinity. Even if slightly acid when first prepared "Bordeaux" usually becomes distinctly alkaline later on owing to the neutralizing action continuing.

Physical Nature of the Precipitate.

This is probably of equal importance to the chemical composition, since it has an important bearing on the adherence of the "Bordeaux," which varies very considerably according to the mode of preparation. It is for this reason that it is so important that the line should be poured into the copper sulphate solution, and not the copper into the lime milk. In the former case the vesicles mentioned above are a characteristic feature of the precipitate; in the latter case they do not occur—the precipitate, though light, is granular, and on drying is much less adherent to the green tissues of the vine.

The Galloway or American method of preparing "Bordeaux," in very general use by Victorian orchardists, certainly gives a mixture of very high quality, with a fine, light precipitate which adheres well. It consists in making a dilute solution of sulphate of copper and a dilute milk of lime. These two are intimately mixed by running them separately in equal quantities at a time into a third vessel. The main feature of the method is that dilute solutions are made to react on one another; the

precipitate thus obtained is much lighter than when concentrated solutions are mixed together.

By mixing concentrated milk of lime in small quantities at a time into very dilute copper solution practically equal results can be obtained so far as the fineness of precipitate is concerned, but only on the one condition that stirring be very thorough. This has been abundantly proved by experiment. The formula given below is more convenient than the Galloway method, as it does not necessitate the employment of so many vessels to contain the bulky dilute solutions; with it, only one such is required. Provided that stirring be sufficiently thorough the resultant "Bordeaux" will be quite equal to that obtained by the Galloway method. It also presents the advantage that good results can be obtained with lime not of first class quality. With the Galloway method the lime must be weighed, and with any but quite pure quicklime, weighing is a most unreliable means of ascertaining the true quantity of lime employed. Gauging the lime by means of test paper is in such a case to be preferred. It is, nevertheless, always well to employ the best lime obtainable. Lime which has been partially carbonated gives a "Bordeaux" which may burn the foliage badly.

Acid v. Alkaline "Bordeaux."

This is the most important point on which opinions differ. Reams of paper have been written and high authorities may be quoted on both sides in, what may be termed, the battle of green *versus* blue. Acid "Bordeaux" has a greenish tinge, whereas if it be alkaline the markings left on the leaves of the vine are of a light sky-blue colour. Theoretical considerations concerning the greater efficacy of Tetrasupric sulphate notwithstanding,* the blue partisans seem to be holding their own in the practical field. Alkaline "Bordeaux" seems to possess greater adherence and to afford at least equal protection in the opinion of some of the leading French authorities to-day. Advocates of acid "Bordeaux" admit the durability of action of the alkaline form, but consider it to be less active when first applied than that which contains a considerable amount of the slightly soluble Tetracupric sulphate. Into all the details of this interesting controversy it is impossible to go here. It will suffice to say that the conclusion arrived at by Professor Ravaz as the result of extensive field trials carried out during the past two years with numerous different fungicides is that alkaline mixtures have proved themselves quite equal to acid ones. There appears to be remarkably little difference between the practical value of the two. One great advantage of alkaline "Bordeaux" is that it is possible to increase its wetting or spreading power by the addition of casein, a substance which cannot be used in connexion with an acid mixture, by which it would be curdled.

Wetting Power.

If a vine leaf be dipped into soapsuds it will on withdrawal be found to be thoroughly wetted, whereas if dipped into pure water large portions of it usually remain dry. Various substances have been recommended

* Tetracupric sulphate is most abundant in slightly acid "Bordeaux."

for increasing this wetting power, amongst others soap, gelatine, saponine, and casein. Numerous soap mixtures (containing copper, of course) have been recommended, but have since been abandoned, mainly owing to the depressing action of the soap on the vegetation of the vine. Gelatine is an excellent substance for the purpose, but it can only be added to acid "Bordeaux" and, as will be gathered from the above, this is rather difficult to prepare. Saponine is not obtainable in Australia.* Casein, on the other hand, is easily procurable; it is a by-product of the dairying industry, and is worth about a shilling a pound. The quantity necessary to confer wetting power is one ounce for every ten gallons.

This substance is somewhat difficult to incorporate with Bordeaux Mixture, to which it should not be directly added, as it would merely float on the surface and form lumps. It should be separately dissolved, the solution or emulsion thus obtained being added to the spray mixture.

The proper quantity of casein—5 ozs. for 50 gallons of spray—may, after thorough mixing with a couple of handfuls of slacked lime in powder, be worked into a smooth cream with a little water, this being further diluted to ½ gallon (a dipper full) of an emulsion rather than a solution. Very little of the lime is dissolved; the greater part of it remains in suspension. The whole is then poured into the 50 gallons of spray mixture through a fine sieve, with thorough stirring. Casein may also be dissolved in 10 per cent. soda carbonate (ordinary washing soda) solution—1 lb. to 1 gallon water. Rub to a smooth paste with a little of the solution, more being added to make up ½ gallon of emulsion.

The most convenient way to dissolve casein, however, is by means of an ordinary egg-beater. The 5 ozs. casein, mixed with about its own weight of dry slacked lime, is merely added to the ½ gallon of water on the surface of which it floats. On turning the handle of the egg-beater, the casein is rapidly sucked into the liquid, with which it becomes thoroughly incorporated and soon dissolves. It may also be dissolved in similar manner in 10 per cent. soda carbonate, in which case it is unnecessary to first mix it with lime.

Addition of Sulphur to Bordeaux.

Copper fungicides are almost useless against Oidium, for which sulphur is the standard treatment. A sulphuring may be saved by incorporating sulphur with Bordeaux Mixture, the composition of which is not affected in any way thereby. The usual quantity is from 7 to 10 lbs. of sulphur to 50 gallons of spray mixture. The finer the sulphur, the less of it will be required; it is possible that with precipitated sulphur, which is in a very fine state of division, considerably less than 7 lbs. would suffice. Sulphur is somewhat difficult to mix with Bordeaux. In France, special so-called "wettable" sulphurs are obtainable. Treatment with oleic acid (1 lb. dissolved in a quart of methylated spirit to 1 cwt. of sulphur) renders it wettable. The oleic acid solution should be mixed with the sulphur in much the same way as bluestone solution is used for pickling wheat. The sulphur may also be worked into a

* It is possible that a similar substance might be extracted from the prickly pear.

smooth cream with a weak solution of glue—½ oz. to a gallon of water—which is then added to the spray mixture. In the case of Bordeaux with Casein, it is quite easy to incorporate the sulphur with the casein solution with the assistance of the egg-beater as described above.

PRACTICAL DIRECTIONS FOR MAKING BORDEAUX MIXTURE.

The following is simpler than the Galloway (American) method. Provided stirring be very thorough at each addition of lime, and after final dilution, an equally good spray mixture will result. The present method is to be preferred if the lime be not of first class quality:—

Materials.—Copper sulphate, 10 lbs.; fresh quicklime, 5 lbs. (about); water, 50 gallons. If the lime is of poor quality, or air-slaked, more than 5 lbs. will be required; if pure and fresh, less will suffice.

Utensils.—A 60-gallon hogshead with one head removed (pegs should be inserted inside to show the 10 and 50 gallon levels); two or three kerosene tins for boiling water in; a tub or tin to slake the lime—capacity about 10 gallons; an earthenware jug or jar—capacity 1 gallon; a dipper—enamelled or painted inside and out; a fine sieve; some phenolphthalein testing paper (this can be obtained from any chemist; it consists of strips of white filter paper wetted with a 5 per cent. solution of phenolphthalein in methylated spirit and allowed to dry); a stirring device, such as a stout broom handle, to which is fixed a small piece of board.

Operations.—Dissolve the copper sulphate in 5 gallons or so of hot water; make up to 10 gallons with cold water. A stock solution of copper sulphate (1 lb. to 1 gallon of water) may be made up. This will keep indefinitely. Ten gallons of this stock solution should be taken for each cask of mixture. Remove 1 gallon of this solution in the earthenware jug or jar, and place it to one side. Add about 20 gallons of water to the copper sulphate solution in the cask (this need not be measured). Slake the quicklime by adding small quantities of water at a time. When slaked, add water sufficient to make about 6 or 8 gallons of milk of lime Pour this lime milk through the sieve into the bulk copper sulphate solution, with brisk stirring until neutralized. Neutralization is shown by the phenolphthalein paper turning pink. Stop adding lime milk as soon as the test paper turns faintly pink. (The test paper can with advantage be pinned to a small stick to avoid touching with fingers wetted with lime water, which would result in misleading indications). Add 1 gallon of copper sulphate to the solution previously withdrawn. Stir thoroughly. The more thorough the stirring the better the mixture. Make up to 50 gallons with water, and stir again. The mixture is now ready for use. It should be used fresh, only sufficient for the day's requirements being made up at one time.

Copper sulphate solution must not be handled in iron or tin vessels unless these have been very thoroughly painted or tarred both inside and out; wood or enamel vessels are to be preferred.

High-grade quicklime is now obtainable, packed in airtight tins. With this weighing may be resorted to—2½ lbs. will completely neutralize the 10 lbs. copper sulphate required for 50 gallons of spray mixture.

"*Bordeaux with Casein.*—The "wetting" or spreading power of the mixture can with advantage be thus increased. 5 ozs. casein will suffice for 50 gallons of spray, which must be sufficiently alkaline to redden phenolphthalein paper. If this does not occur add more lime. 5 ozs. casein mixed as described above is sufficient for 50 gallons of Bordeaux.

INDIGENOUS FIBROUS PLANTS OF VICTORIA.

By J. W. Audas, F.L.S., F.R.M.S.; Assistant, National Herbarium, Melbourne.

The continuance of the war has aroused a wide-spread interest in the uses and commercial value of many of the natural products of Australia, and the recently-formed Commonwealth Bureau of Science and Industry intends to experiment with plants of various kinds in order to ascertain if they have any economic value. As the shortage of shipping gradually becomes more acute we shall be compelled to seek locally for many articles which hitherto have come from overseas, or at any rate, to look for substitutes. Endeavour should therefore be made by everybody interested to ascertain by investigation what commercial value our trees and plants possess before permitting further areas of them to be wantonly destroyed. Extensive tracts of country have been cleared which formerly bore the richest and most varied vegetation. The brush forests so general along our coasts are fast disappearing with the advance of settlement. It is advisable therefore to bring under notice a few plants which would yield strong and durable fibres suitable for a variety of purposes.

The economic value of most of the diversified vegetation of the Commonwealth is little known, and it is only from the timbers that any financial benefit worth speaking of has been derived. There are many plants in the Victorian flora admirably adapted for the manufacture of fibres. Experiments were carried out from time to time by the late Baron von Mueller, Government Botanist, and the late W. R. Guilfoyle, Director of the Melbourne Botanic Gardens, the results of which show the economic uses to which some of our plants could be put. The following Genera can be specially recommended, viz., Acacia, Eucalyptus, Melaleuca, Plagianthus, Pimelea, Rulingia, Commersonia, Casuarina, Brachychiton, Bedfordia, Lavatera, Linum, Xanthorrhœa, Dianella, Juncus, Lomandra, Typha, Carex, Gahnia, Cyperus, Heleocharis, Schoenus, Scirpus Livistona, Lepidosperma, and other sedges, besides Stipa, Dichelachne, Poa, Arundo, Tetrarrhena, Imperata, and other grasses.

Fibres can be made from:—

1. Bark of *Acacia decurrens*, Willd. "Early Black Wattle."
2. Bark of *Acacia mollissima*, Willd. "Late Black Wattle."
3. Bark of *Acacia penninervis*, Sieb. "Hickory Wattle."
3A. Leaves of *Amperea spartioides*, Brongn. "Broom Spurge."
4. Leaves of *Arundo Phragmites,* L. "Common Reel."
5. Leaves of *Bedfordia salicina*, D.C. "Blanket Wood."
6. Bark of *Brachychiton populneus*, R.Br. "Kurrajong."
7. Stems of *Carex paniculata*, L. "Panicle Sedge."
7A. Stems of *Carex pseudo-cyperus*, L. "Galingale Sedge."
8. Stems of *Carex tereticaulis*, F. v. M. "Round Sedge."
9. Branchlets of *Casuarina quadrivalvis*, Labill. "Drooping Sheoke."
10. Branchlets of *Casuarina suberosa*, Otto & Dietrich. "Black Buloke."
11. Branches of *Commersonia Fraseri*, J. Gay. "Black Fellows' Hemp."

12. Stems of *Cyperus lucidus*, R.Br. "Shining-leaf Rush."
13. Stems of *Cyperus vaginatus*, R.Br. "Sheath-leaf Rush."
14. Leaves of *Dianella longifolia*, R.Br. "Long-leaved Flax Lily."
15. Leaves of *Dianella revoluta*, R.Br. "Spreading Flax Lily."
16. Leaves of *Dianella tasmanica*, Hk.f. "Tasman Flax Lily."
17. Stems and leaves of *Dichelachne crinita*, Hk.f. "Long-hair Plume Grass."
18. Bark of *Eucalyptus amygdalina*, Labill. "Common Peppermint."
19. Bark of *Eucalyptus capitellata*, Sm. "Brown Stringybark."
20. Bark of *Eucalyptus corymbosa*, Sm. "Bloodwood."
21. Bark of *Eucalyptus globulus*, Labill. "Blue Gum."
22. Bark of *Eucalyptus goniocalyx*, F. v. M. "Mountain Grey Gum."
23. Bark of *Eucalyptus leucoxylon*, F. v. M. "Yellow Gum."
24. Bark of *Eucalyptus longifolia*, Link. "Woollybutt."
25. Bark of *Eucalyptus macrorrhyncha*, F. v. M. "Red Stringybark."
26. Bark of *Eucalyptus obliqua*, L. Herit. "Messmate Stringybark."
27. Bark of *Eucalyptus rostrata*, Schl. "River Red Gum."
28. Bark of *Eucalyptus Stuartiana*, F. v. M. "Apple Box."
29. Leaves of *Gahnia psittacorum*, Labill. "Giant Saw Sedge."
30. Leaves of *Gahnia Radula*, Benth. "Black Saw Sedge."
31. Stems of *Heleocharis acuta*, R. Br. "Common Spike Rush."
32. Stems of *Juncus Communis*, E. Mey. "Common Rush."
33. Stems of *Juncus maritimus*, Lam. "Shore Rush."

33A. Stems of *Juncus prismatocarpus*, R. Br. "Branching Rush."

34. Stems of *Juncus pallidus*, R. Br. "Pale Rush."

34A. Stems of *Juncus pauciflorus*, R. Br. "Few-flowered Rush."

35. Stems and leaves of *Lavatera plebeia*, Sims. "Austral Hollyhock."
36. Stems and leaves of *Lepidosperma elatius*, Labill. "Tall Sword Sedge."
37. Stems and leaves of *Lepidosperma gladiatum*, Labill. "Coast Sword Sedge."
38. Stems and leaves of *Lepidosperma longitudinale*, Labill. "Swamp Sword Sedge."
39. Stems and leaves of *Linum marginale*, Cunn. "Wild Flax."
40. Leaves of *Livistona australis*, Mart. "Cabbage Tree Palm."
41. Stems and leaves of *Lomandra* (*Xerotes*) *longifolia*, Labill. "Long Mat Rush."
42. Bark of *Lyonsia straminea*, R. Br. "Twining Silk Pod."
43. Bark of *Melaleuca squarrosa*, Don. "Scented Paper Bark."
44. Bark of *Pimelea axiflora*, F. c. M. "Tough Rice-flower."
45. Bark of *Pimelea liqustrina*, Labil. "Tall Rice-flower."
46. Stems and leaves of *Poa caespitosa*, Forst. "Tufted Meadow Grass."
47. Stems and leaves of *Schoenus brevifolius*, R. Br. "Short-leaved Bog Grass."

48. Stems and leaves of *Scirpus maritimus*, L. "Salt-marsh Club Rush."
49. Stems and leaves of *Stipa semibarbata*, R. Br. "Fibrous Spear Grass."
49A. Stems and leaves of *Stypandra caespitosa*, R.Br. "Tufted Blue Lily."
50. Leaves of *Typha angustifolia*, L. "Bulrush."
51. Leaves of *Xanthorrhœa australis*, R. Br. "Southern Grass Tree."
52. Leaves of *Xanthorrhœa hastilis*, R.Br. "Spear Grass Tree."
53. Leaves of *Xanthorrhœa minor*, R.Br. "Small Grass Tree."
54. Stems and leaves of *Urtica incisa*, Pois. "Scrub Nettle."
55. Stems of *Tetrarrhena juncea*, R.Br. "Wire Grass."
56. Stems of *Imperata arundinacea*, Cyr. "Blady Grass."

Fibres from Barks.

The best fibre-yielding barks are those of the Eucalypts, the most important being Eucalpytus obliqua (L'Herit), "Messmate Stringybar"; order, Myrtaceæ; distribution, Victoria, New South Wales, South Australia, and Tasmania. Paper prepared from the bark of this tree would be suitable for packing, printing, and even writing purposes, as well as for mill and paste boards. The pulp bleaches readily, and the bark is extremely thick and bulky, and separates very easily, qualities which, in early settlement days, gave it a use as thatch for rural dwellings, &c. The area within Victoria almost exclusively wooded with stringybank forests extends over many thousands of square miles. The bark of other Eucalypts may likewise be converted into paper, the whole thick stratum of the bark being used, which, owing to its loose nature, yields readily to mechanical application, and is easily acted on by caustic soda for conversion into pulp.

Eucalyptus globulus, Labill, "Blue Gum"; order, Myrtaceæ; distribution, Victoria, New South Wales, and Tasmania. The well-known Blue Gum of Victoria abounds in valleys and moist declivities of wooded mountains from Apollo Bay to beyond Wilson's Promontory, extending here and there gregariously to the Pyrenees and the Buffalo Ranges. Its bark is suitable for the manufacture of packing and, probably, printing paper.

Eucalyptus amygdalina, Labill, "Common Peppermint"; order, Myrtaceæ; distribution, Victoria, New South Wales, South Australia, and Tasmania. The Common Peppermint is abundant throughout the greater part of Victoria. Its foliage is more oily than that of most of its congeners, and its inner bark is adaptable for the preparaton of coarse paper.

Eucalyptus goniocalyx, F. v. M., "Mountain Grey Gum"; order, Myrtaceæ; distribution, Victoria, New South Wales, and South Australia. The Mountain Grey Gum of Victoria, called in some districts the "Spotted Gum," is found chiefly in the fertile ranges of Gippsland. The foliage is rich in volatile oil, and the bark is suitable for the making of packing paper, but is not adaptable for the manufacture of writing-paper.

Eucalyptus corymbosa, Sm., "Blood Wood"; order, Myrtaceæ; distribution, Victoria, New South Wales, Queensland, and Northern Australia. The Bloodwood occurs in the eastern parts of Gippsland. Paper from the bark of this Eucalypt is remarkable for its great firmness, and consequently makes a very strong wrapping paper.

Eucalyptus longifolia, Link, "Woollybutt"; order, Myrtaceæ; distribution, Victoria and New South Wales. The Woolly Butt is found in the eastern extremity of Gippsland, and supplies bark suitable for paper making.

Eucalyptus Stuartiana, F. v. M., "Apple Box"; order, Myrtaceæ; distribution, Victoria, New South Wales, South Australia, Tasmania, and Queensland. The Apple Box is abundant in many parts of this State, and its bark furnishes good material for paper making and paste boards.

Eucalyptus rostrata, Schl., "River Red Gum"; order, Myrtaceæ; distribution, Victoria, New South Wales, South Australia, Queensland, Northern Australia, and Western Australia. "The River Red Gum" is found throughout the greater part of Victoria, and its timber is of great commercial importance. The bark-fibre is useful for making the coarser kinds of paper.

Euclapytus macrorrhyncha, F. v. M. "Red Stringybark"; order, Myrtaceæ; distribution, Victoria, New South Wales, and South Australia. The Red Stringybark is widely distributed throughout Victoria. Its thick fibrous bark is extensively used for roofing huts, sheds, &c., and the bark is adaptable for the manufacture of all kinds of coarse paper.

Besides those above-mentioned, many other Eucalypts would be found to bear a bark suitable for paper making.

Acacia penninervis, Sieb., "Hickory Wattle"; order, Leguminosea; distribution, Victoria, New South Wales, Tasmania, and Queensland. The Hickory Wattle is a tree of small size, found chiefly on the granite ranges in Gippsland and north-eastern parts of Victoria. It yields a bark suitable for coarse paper making, and from that of many other species of this large genus a substantial packing paper can be produced.

Melaleuca ericifolia, Sm., "Swamp Paper Bark," or the so-called "Swamp Tea Tree"; order, Myrtaceæ; distribution, Victoria, New South Wales, South Australia, Tasmania, and Queensland. The Swamp Paper Bark is abundant in moist places and stagnant waters near the coast and inland. It is clothed with a bark adaptable for the making of blotting paper, and probably filtering paper. It is worthy of note that many species of this genus yield barks alike in appearance, and formed of innumerable membraneous layers.

Brachychiton populneus, R.Br., "Kurrajong"; order, Sterculiaceæ; distribution, Victoria, New South Wales, and Queensland. The Kurrajong is found on the Hume River, and on the granite ranges of the Snowy River and its tributaries. It produces a bark with strong fibre, and was used by aboriginals for making fishing nets.

Pimelea ligustrina, Labill, "Tall Rice Flower"; order, Thymeleaceæ; distribution, Victoria, New South Wales, South Australia, and Tasmania. The Tall Rice-Flower is common in dense humid forests chiefly in the eastern parts of the State. It yields a fibre of great strength.

Pimelea axiflora, F. v. M., "Tough Rice Flower"; order, Thymeleaceæ; distribution, Victoria, New South Wales, and Tasmania. The

Tough Rice-flower is widely distributed throughout the State, and furnishes an excellent fibre of great strength. It is often used for boot laces, and for tying up parcels or bunches of flowers.

Plagianthus pulchellus, A. Gray, "Hemp Bush"; order, Malvaceæ; distribution, Victoria, New South Wales, South Australia, and Tasmania. The Hemp Bush is usually found near the banks of creeks, &c., and produces a fibre soft, glossy, and long, suitable for warp yarn, either by itself or as a mixture.

Rulingia pannosa, R. Br., "Kerrawan"; order, Sterculiaceæ; distribution, Victoria, New South Wales, and Queensland. The Kerrawan is found in the north-eastern parts of Victoria, and yields a very useful fibre.

Commersonia Fraseri, J. Gay, "Blackfellows Hemp"; order, Sterculiaceæ; distribution, Victoria, New South Wales, and Queensland. The Blackfellows Hemp is found on the Genoa River and valleys under Genoa Peak. It yields a fine fibre suitable for matting and cordage, and for the manufacture of a good quality paper.

Fibre from Foliage.

Casuarina stricta, "Drooping Sheoke"; order, Casuarineæ; distribution, Victoria, New South Wales, South Australia, Tasmania, and Western Australia. The Drooping Sheoke is a common tree of the coast of Victoria. It has a stringy foliage which can be converted into an excellent pulp for packing paper, and even printing paper and millboards.

Casuarina suberosa, Otto & Dietr., "Black Buloke"; order, Casuarineæ; distribution, Victoria, New South Wales, South Australia, Tasmania, and Queensland. The Black Buloke, widely distributed in Victoria, is an erect tree producing foliage containing the same properties as the last mentioned species.

Bedfordia salicina, D.C., "Blanket Wood"; order, Compositæ; distribution, Victoria, New South Wales, and Tasmania. The Blanket Wood is found chiefly in moist situations in the south and eastern parts of the State. It yields a white flock resembling scoured wool from the under part of the leaves, and paper could be made from it.

Lavatera plebeja, Sims, "Austral Hollyhock"; order, Malvaceæ; distribution, Victoria, New South Wales, South Australia, Tasmania, Queensland, and Western Australia. The Austral Hollyhock is a perennial shrub, and is found in considerable quantity along the Murray and many of its tributaries, being besides scattered over several different parts of the State. It grows luxuriantly in tracts of country which appear almost useless for other purposes, and has been successfully tried for oakum rope and paper making. If required for the latter purpose, the shrubs should be pulled up by the roots, and hung up in bundles to dry. When sufficiently dry, they should be chopped up small, and treated with a diluted solution of caustic alkali to remove the gummy matter which they contain. After bleaching the material should be treated in the same way as rags which are intended for paper making.

Linum marginale, Cunn., "Wild Flax"; order, Linaceæ; distribution, Victoria, New South Wales, Tasmania, South Australia, and Western Australia. The Wild Flax is abundant throughout this State,

and although a smaller plant than the true flax, nevertheless it yields a fibre of splendid quality. It was used by the natives for making fishing nets and cordage.

Livistona australis, Mart., "CABBAGE TREE PALM"; order, Palmæ; distribution, Victoria, New South Wales, and Queensland. The Cabbage Tree Palm is found in the eastern extremity of Gippsland. The foliage is used for baskets and hats, the latter very much resembling the celebrated panama.

Urtica incisa, Poir, "SCRUB NETTLE"; order, Urticaceæ; distribution, Victoria, New South Wales, South Australia, Tasmania, and Queensland. The Scrub Nettle delights to hide itself in the moist and densely shaded fern gullies and ravines in the sub-alpine localities of Victoria and Tasmania. Its stems and leaves yield useful paper-making material.

Amperea spartioides, Brongn., "BROOM SPURGE"; order, Euphorbiaceæ; distribution, Victoria, New South Wales, South Australia, Tasmania, and Queensland. The Broom Spurge is of a dwarf shrubby habit, and grows abundantly in the eastern portion of Victoria. It yields a useful fibre material.

Scirpus maritimus, "SALT-MARSH CLUB RUSH"; order, Cyperaceæ; distribution, Victoria, New South Wales, South Australia, Tasmania, Queensland, Northern Australia, Western Australia, Europe, Asia, Africa, America, and New Zealand. The Salt-marsh Club Rush is a plant almost cosmopolitan, occurring frequently in more or less brackish waters, and yielding a fibre which would produce paper sufficiently firm to stand the impressions of type.

Scirpus lacustris, L., "LAKE CLUB RUSH"; order, Cyperaceæ; distribution, Victoria, New South Wales, South Australia, Tasmania, Queensland, Western Australia, Europe, Asia, Africa, America, and New Zealand. The Lake Club Rush grows in moist parts nearly all over the world. Being of gregarious habit the plant is readily collected. The paper produced from it is remarkably good, and adaptable for either printing or tissue paper, as well as for writing paper. It is also used for making seats of chairs, and by coopers for caulking casks.

Scirpus nodosus, Rottb., "KNOTTED CLUB RUSH"; order, Cyperaceæ; distribution, Victoria, New South Wales, South Australia, Tasmania, Queensland, Western Australia, Africa, America, India, and New Zealand. The Knotted Rush, a tufted perennial plant with creeping rhizomes, is plentiful along the coast of Victoria, where it tends to bind drifting sand. It forms a good paper plant, but as a fibre plant for other purposes it is of little use.

Cyperus vaginatus, R. Br., "SHEATH LEAF RUSH"; order, Cyperaceæ; distribution, Victoria, New South Wales, South Australia, Queensland, Western Australia, and Northern Australia. The Sheath Leaf Rush is one of the most widely and most copiously distributed of the rush plants of Australia. It has a tough fibre, and consequently can be manufactured into very tenacious paper. The raw material is available in considerable quantities on periodically flooded river flats, swamp localities, and other moist places.

Cyperus lucidus, R. Br., "SHINING-LEAF RUSH"; order, Cyperaceæ; distribution, Victoria, New South Wales, South Australia, Tasmania, Queensland, Northern Australia, and Western Australia. The Shining-

leaf Rush is a tufted water plant widely distributed over Australia. The fibre is obtained by the boiling process.

Heleocharis acuta, R. Br., "TALL SPIKE RUSH"; order, Cyperaceæ; distribution, Victoria, New South Wales, South Australia, Tasmania, Queensland, Northern Australia, Western Australia, America, New Zealand. The Tall Spike Rush is common in moist places over a considerable portion of Victoria. It is exquisitely adapted for the making of good printing and tissue papers, and fairly good writing-paper.

Lepidosperma gladiatum, Labill, "COAST SWORD SEDGE"; order, Cyperaceæ; distribution, Victoria, New South Wales, South Australia, Tasmania, Western Australia. The Coast Sword Sedge is found everywhere on the maritime shores of this State, where it tends to bind the shifting sand. It has been subjected to successful tests of paper fabrication, the article produced therefrom being of strong texture. A manufacturer in England who has tried the paper-making qualities of this plant reports that there is no doubt whatever that it will make good paper. It may be cut down annually, and will spring up year after year from the same roots. If allowed to remain on the ground for ten or fifteen days after cutting, exposed to the action of the weather, and turned over occasionally, it will become partially bleached.

Lepidosperma longitudinale, Labill, "SWAMP SWORD SEDGE"; order, Cyperaceæ; distribution, Victoria, New South Wales, South Australia, Tasmania, and Western Australia. The Swamp Sword Sedge is one of the tall sword rushes very abundantly distributed on marshy land of the south-eastern portion of Victoria. It is a good paper-producing plant under somewhat similar treatment to that suggested for Coast Sword Sedge.

Lepidosperma elatius, Labill, "TALL SWORD SEDGE"; order, Cyperaceæ; distribution, Victoria, South Australia, and Tasmania. The Tall Sword Sedge attains a height of from 5 to 8 feet, and is very common in forests and damp soils in the eastern and southern portions of the State. Like most of the genus it yields a good paper pulp.

Juncus communis, E. Mey, "COMMON RUSH"; order, Junceæ; distribution, Victoria, New South Wales, South Australia, Tasmania, Queensland, and Western Australia, Europe, Asia, Africa, America, Polynesia, and New Zealand. The Common Rush is a cosmopolitan species, and may be obtained in enormous quantities in moist places throughout the whole of the extra tropical parts of Australia. It makes excellent material for printing tissue.

Juncus pallidus, R. Br., "PALE RUSH": order, Junceæ; distribution, Victoria, New South Wales, South Australia, Tasmania, Queensland, Western Australia, and New Zealand. The Pale Rush, like the Common Rush, has a very wide geographical range, being plentiful in marshes and moist sandy tracts near the sea coast. It also makes material for a good paper stock.

Juncus pauciflorus, R. Br., "FEW-FLOWERED RUSH"; order, Junceæ; distribution, Victoria, New South Wales, South Australia, Tasmania, and Queensland. The Few-flowered Rush is abundant throughout the State. It is supposed to be an excellent paper material, and furnishes also a fibre of considerable strength.

Juncus prismaticarpus, R. Br., "BRANCHING RUSH": order, Junceæ; distribution, Victoria, New South Wales, South Australia, Tasmania, Queensland, and Western Australia. The Branching Rush

is a dwarf flat stemmed species seldom more than from 18 inches to 2 feet in height. It is abundant in swampy ground near the sea coast, and may prove valuable as a paper plant.

Schoenus brevifolius, R. Br., " SHORT-LEAVED BOG RUSH " ; order, Cyperaceæ; distribution, Victoria, New South Wales, South Australia, Tasmania, Queensland, and Western Australia. The Short-leaved Bog Rush is a tufted perennial, very plentiful along the coast, especially the south-eastern portion of the State. It furnishes good paper material and a fibre of considerable strength.

Carex paniculata, L., " PANICLE SEDGE " ; order, Cyperaceæ; distribution, Victoria, New South Wales, South Australia, Tasmania, Queensland, Tasmania, and Western Australia. The Panicle Sedge is found generally throughout the State in low-lying swampy grounds, and along river and creek courses. It yields a fibre suitable for paper and mill-boards.

Carex pseudo-cyperus, L., " GALINGALE SEDGE " ; order, Cyperaceæ; distribution, Victoria, New South Wales, South Australia, Tasmania, Queensland, and Western Australia. This species of sedge is very common throughout Victoria in swampy and moist places, and yields a strong fibre, which is prepared by boiling for twelve hours, and then scraping the leaves.

Lomandra (Xerotes) longifolia, R. Br., " LONG MAT RUSH " ; order, Liliaceæ; distribution, Victoria, New South Wales, South Australia, Tasmania, and Queensland. The Long Mat Rush is a perennial plant dispersed throughout the State on dry and moist soils. It furnishes a valuable pulp, which can be utilized both for printing and writing paper. It is, however, scarcely as readily collected as many of the other plants just referred to.

Stypandra caespitosa, R. Br., " TUFTED BLUE LILY " ; order, Liliaceæ; distribution, Victoria, New South Wales, Queensland, and Tasmania. The Tufted Blue Lily is a hardy herbaceous perennial found in the eastern and southern parts of the State. It yields a strong fibre, and is readily prepared by a boiling process.

Typha angustifolia, L., " BULRUSH" ; order, Typhaceæ; distribution, Victoria, New South Wales, South Australia, Tasmania, Queensland, Northern Australia, Western Australia, Europe, Asia, Africa, America, Polynesia, and New Zealand. The Bulrush is a cosmopolitan aquatic perennial, and is identical with the common, narrow-leaved species of Britain and other parts of the globe. It is very plentiful in Victoria on the banks of streams and fresh water swamps. The pulp of the weighty foliage is easily pressed into good printing, tissue, and writing paper, and a fibre of fair strength can be manufactured from the leaves.

Xanthorrhœa minor, R. Br., " SMALL GRASS TREE " ; order, Liliaceæ; distribution, Victoria, New South Wales, South Australia, and Tasmania. The Small Grass Tree is a stemless, liliaceous plant extending on temporarily inundated flats, with heathy sub-soil almost uninterruptedly over many square miles of the Western Port districts, Gippsland, and other Victorian localities. There are occasionally lines of many miles extent scarcely interrupted by any other vegetation. The broad rigid tufts approach each other to the exclusion of gradual suffocation of most other plants of the locality. The harsh foliage,

available in such very large quantities, can be readily converted into an excellent printing paper, as well as good writing paper.

Xanthorrhœa australis, R. Br., "SOUTHERN GRASS TREE"; order, Lilliaceæ; distribution, Victoria and Tasmania. The Southern Grass Tree is widely dispersed throughout the State, and may be had in abundance. It prefers sandy soil, and is found in profusion on coastal plains almost anywhere between the South Australian border and Cape Howe. The leaves of this species of grass tree afford a very good fibre, but it is somewhat difficult to prepare on account of the quantity of silica and resin which the leaves contain. Resin obtainable from the base of the leaves, and from the trunk, is in demand as a colouring for varnishes, for the manufacture of sealing wax, for dyeing purposes, and also for the large percentage of picric acid which it contains. The stem sometimes attains a height of 10 or 12 feet, and is crowned with a dense head of brush-like leaves. The flower scape is often 8 feet or more in length.

Xanthorrhœa hastilis, R. Br., "SPEAR GRASS TREE"; order, Liliaceæ; distribution, Victoria, New South Wales, and Queensland. The Spear Grass Tree is confined in Victoria to the eastern extremity of Gippsland, and as a fibre-plant is quite equal to the preceding species.

Dianella tasmanica, Hook. f., "TASMAN FLAX LILY"; order, Liliaceæ; distribution, Victoria, New South Wales, and Tasmania. The Tasman Flax Lily abounds in the densely shaded fern gullies of the eastern parts of Victoria, where it grows abundantly, and frequently it is found overhanging banks of mountain streams. It is a good fibre plant, and supplies splendid paper stock. The fibre of this plant was used by the natives for making baskets.

Dianella tasmanica, Hook, f., "TASMAN FLAX LILY"; order, Liliaceæ; distribution, Victoria, New South Wales, South Australia, Tasmania, and Queensland. The Long-leaved Flax Lily is an herbaceous perennial which bears an inflorescence of sky-blue flowers, and when in fruit its shining blue berries render it very attractive and showy. It produces a strong fibre of fine. silky texture, which could be made into twine and fishing lines.

Dianella revoluta, R. Br., "SPREADING FLAX LILY"; order, Liliaceæ; distribution, Victoria, New South Wales, South Australia, Tasmania, Queensland, and Western Australia. The Spreading Flax Lily is very plentifully distributed throughout the State, and thrives well in sandy soils. It produces a fair fibre, which is obtained by boiling and scraping the leaves.

Imperata arundinacea, Cyr., "BLADY GRASS"; order, Gramineæ; distribution, Victoria New South Wales, South Australia, Tasmania, Queensland, Northern Australia, and Western Australia, Europe, Asia, Africa, America, Polynesia, and New Zealand. The Blady Grass is a showy cosmopolitan grass, usually found in wet undrained land or sour soils in the moist parts of Victoria. Its strong, broad leaves are often used by brickmakers for a thatch to protect bricks when wet, and it is recommended for binding river banks and loose coast sands. It has been suggested that it might be found useful for paper making.

Arundo Phragmites, "L," "COMMON REED"; order, Gramineæ; distribution, Victoria, New South Wales, South Australia, Tasmania, Queensland, Western Australia, Europe, Asia, Africa, America, Polynesia, and New Zealand. The Common Reed is a tall, cosmopolitan

perennial grass, growing plentifully along the borders of banks of streams, where it tends to bind the earth with its extensive creeping root-stocks. This rush was formerly much availed of by the natives of Victoria for making bags or baskets.

Tetrarrhena juncea, R. Br., "WIRE GRASS"; order, Gramineæ; distribution, Victoria, New South Wales, and Tasmania. The Wire Grass is a climbing plant often growing to a height of 15 feet or more among the branches of shrubs and small trees in the uplands of the State. It furnishes a pulp suitable for the manufacture of packing and writing paper.

Dichelachne crinita, Hook, f., "LONG-HAIR PLUME GRASS"; order, Gramineæ; distribution, Victoria, New South Wales, South Australia, Tasmania, Queensland and Western Australia. The Long-hair Plume Grass is widely diffused over extra tropical Australia, and occurs also in New Zealand. This grass yields material for a tenacious paper, especially fit to be used for a thin packing or wrapping paper.

Stipa semibarbata, R. Br., "FIBROUS SPEAR GRASS"; order, Gramineæ; distribution, Victoria, New South Wales, South Australia, Tasmania, Queensland, and Western Australia. The Fibrous Spear Grass is to be found almost everywhere throughout south-eastern Australia and Tasmania. It produces material for substantial paper, but less than that of the preceding kind.

Poa caespitosa, G. Forster, "TUFTED MEADOW GRASS"; order, Gramineæ; distribution, Victoria, New South Wales, South Australia, Tasmania, Queensland, and Western Australia. The Tufted Meadow Grass is a coarse perennial, and grows in large tussocks on moist flats and swampy lands. It affords a good fibre of fair quality, and makes an excellent paper stock.

The foregoing list is, of course, by no means complete. My object is simply to direct attention to a portion of our flora having a commercial value, in order that those who are interested in the manufacture of a few articles, for which we now look to overseas countries, may know the plant which will furnish the chief constituents. No doubt from many other Australian plants materials for paper making could be obtained, and the suitability of several of the local grasses and seaweeds for the weaving of rope, &c., was tested long since by our aborigines.

AT the tractor ploughing competition for a shield presented by the Food Production Department in England, Herefordshire was the winning county in March, with a total of 154½ acres ploughed. The winning team from 24th August to 5th April ploughed 662 acres, besides doing threshing and other work. Their average for period of thirty-one weeks, including stoppages through wet weather, works out at 21½ acres per week. During March forty tractors in Herefordshire ploughed 2,584 acres.

THE RESIDUAL EFFECT OF SUPERPHOSPHATE.

By George S. Gordon, Field Officer, Werribee Research Farm.

It is generally recognised that the soil over the greater portion of Victoria is more or less deficient in those natural phosphates which are required if maximum yields are to be obtained. In some districts, when the first few crops have further depleted the virgin soil of this element, profitable crops can no longer be grown without the use of farm-yard manure or artificial fertilizers—generally superphosphate. On the average farm the quantity of manure available, and the labour necessary for distributing it, are limited, while the smaller quantity required per acre, easy distribution by means of the grain and fertilizer drill, together with the handsome profit earned on the outlay, has in the past few years caused a great increase in the demand for such fertilizers as superphosphate, Thomas' phosphate, basic phosphate, bonedust, &c., all of which contain the essential plant food—phosphorus—in different forms.

The following figures from the *Victorian Year-Book* for 1913-14 show a gradual increase in the use of artificial fertilizers from 1901 to 1913:—

Year.	Farmers Using.	Area used on.	Manure Used.	
			Natural.	Artificial.
		Acres.	Tons.	Tons.
1901	11,439	556 777	153,611	23,535
1902	18 537	1,099,686	206,676	36,630
1903	19 921	1,205 443	207.817	41,639
1904	20,167	1,521,946	190,903	45,940
1905	21,586	1,791 537	210 507	54,674
1906	23 072	1,985 148	205 906	60,871
1907	23,733	2 018 079	232 394	62,337
1908	24 437	2,053,987	235,492	64,715
1909	26 690	2,407.331	197,446	77,579
1910	27,845	2 714,854	203 884	86,316
1911	26,159	2 676,408	205,739	82,581
1912	29,524	3,029,418	222,253	94,010
1913	30,610	3,401,013	219,423	105,612

"The area on which manure was used represented only 7 per cent. of that under crop in 1898," comments the Government Statist; "but since then the proportion manured has rapidly increased. In 1901 it was 19 per cent.; in 1903, 36 per cent.; in 1904, 46 per cent.; in 1905, 56 per cent.; in 1909, 66 per cent.; in 1911 and 1912, 74 per cent.; and in 1913, 77 per cent. During 1913 the quantity of manure imported into Victoria from oversea countries was 87,536 tons, and its value £231,757. Seventy-seven per cent. of the quantity, representing 74 per cent. of the value, consisted of rock phosphates imported from Ocean Island."

It is sometimes said that little progress is being made here in agricultural practice, but the rapid increase in the demand for superphosphate proves that in this branch, at least, an advance has been made. Besides being of direct advantage to the farmer, the manufacture of superphos-

phate has become a valuable industry, supporting a number of workmen, who, in turn, help to create a better demand for farm produce. The increased production following on the use of fertilizers also suggests the possibilities of other discoveries by which greater yields may be won from the soil, and offers encouragement to those interested in the advancement of the science of agriculture.

On the occasion of his visit to Werribee with the members of the British Association for the Advancement of Science, in 1914, the late Dr. T. S. Hall said, "The agricultural problems in Australia awaiting investigation are enormous, and for the solution of these problems the experience of the Old World is of little value. There is great necessity for experiments being conducted towards the development of a system of farming that will meet local soil and climatic conditions."

While the progressive farmer has become fairly well acquainted with the benefits accruing from the rational use of superphosphate, and desires further knowledge regarding its effect on the soil, there are many "beginners," and probably some sceptics, who still require enlightenment on the elementary facts relating to its application and on the scope for greater and more profitable use of fertilizers than obtains at present.

Experiments at the Werribee Research Farm.

If the inquiries made from time to time at the State Research Farm, Werribee, afford any indication of the points about which advice is required, the following would probably be amongst the most important:—

1. What is the "best" quantity to apply?
2. What is the effect of the continuous (from year to year) use of superphosphate?
3. What is the "lasting" or residual effect of superphosphate, and does it "leach" out of the soil, "revert," or become unavailable as a food for plants?

Such pertinent questions indicate a keen desire for knowledge on the subject. The first question has been dealt with from time to time in this *Journal*, and may be tested on private farms; reliable theories, together with some information, based on practice, can be advanced in regard to the second question, but until the last few years little or nothing had been done in Victoria to settle the important matters raised by the final question of the residual effects of superphosphate on succeeding crops, pasture, &c. Though it is known that crops do not always use the whole of the plant food contained in the fertilizer applied to them, in practice it is not often possible to obtain definite or reliable information, especially of a comparative nature, regarding the residual value or effect of the fertilizer on succeeding crops. The varying seasonal conditions and ordinary farm practice generally prevent the observer arriving at a conclusion more definite than an "expression of opinion" that the result was beneficial or otherwise; and as a field experiment to test the matter necessarily extends over a long period, and entails considerable labour and expense, the investigation comes within the province of the Experimental Farm. The State Research Farm at Werribee was established to undertake such work as this, and amongst the many

experiments which are being carried out there, one, known as the Permanent Fertilizer Test, has been conducted for the past five years with the definite object of elucidating problems connected with the use of fertilizers. The records of grain yielded by the various plots in this field have already been published, and, as time advances, the effect of the different fertilizers is becoming accentuated, and the opportunity for making reliable observations is thereby increased.

In order to assist in arriving at a correct judgment of these observations and results, the following brief description and history of the land and scheme of working is given:—

The soil in the field in which the plots are located is a shallow light-red to grey loam, overlaying clay, with basaltic rock coming close to the surface in places. Prior to the establishment of the Research Farm in 1912 it was cultivated for many years chiefly for growing hay, and at the commencement of these tests was deficient in humus and in an exhausted state.

The area was pegged out as an experimental field in 1913. The plots are each a quarter of an acre in extent, and (with the exception of

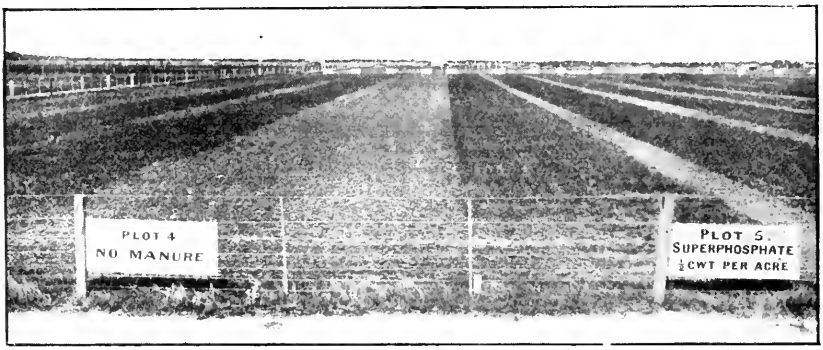


Fig. 1.—Showing effect of the third application of ½ cwt. of superphosphate per acre on the third experimental crop compared with the adjoining unmanured plot.

two which are cropped each year) are set out in duplicate in order that they may be sown on fallow or in rotation with a leguminous crop, one section being in crop and the other in fallow or green crop each year.

Observations Regarding Residual Effect.

During the period 1913-18 there have been some striking differences in the growth of the self-sown crop which came up on the various plots in the autumn, and was allowed to grow till fallowing time (August-September). These growths give an indication of the residual effect of the different fertilizers, and, being side by side in the same field, and a complete history of previous treatment being available, there is a good opportunity to obtain reliable information. While the results are interesting and considered worthy of publication for the information of those using, or contemplating the use of, artificial fertilizers, it should be remembered that it is too early to be dogmatic on the different points, and, as time goes by, it may be necessary to revise some of the conclusions now arrived at.

Several sections in different locations on each of the undermentioned plots were cut on 19th July and again on 7th September, 1917, in the self-sown crop which followed the 1916 harvest. The average weight of the samples from each plot was obtained, and the weight of the crop calculated per acre. These particulars are recorded in Table I. hereunder and the treatment previously given to these plots is shown in Table II. :—

TABLE NO. 1.

SHOWING WEIGHT PER ACRE OF "SELF-SOWN" WHEAT CROP (IN GREEN STATE).

Plot Number.	Fertilizer Applied Per Acre to Wheat Crops in 1914 and 1916.	Calculated Weight of Self-sown Crop per Acre.	
		On 19th July, 1917.	On 7th September, 1917.
		cwt.	cwt.
4A	Nil	0·3	0·5
5A	Superphosphate, ½ cwt.	4·1	12·9
10A	Superphosphate, 1 cwt.	6·5	17·8
6A	Superphosphate, 1½ cwt.	10·0	22·9
7A	Superphosphate, 2 cwt.	13·2	34·8
15A	Superphosphate, ½ cwt. .. .. .. Thomas' Phosphate, ½ cwt.	Not recorded	9·4
14A	Thomas' Phosphate, 1 cwt.	,,	2·6

TABLE NO. 2.

RECORDING RAINFALL AND PREVIOUS TREATMENT.

Year.	Rainfall.	Treatment.
	inches.	
1913 ..	16·45	A crop of peas and beans grown and cut for silage, and the land then summer fallowed
1914 ..	13·22	Sown with Federation wheat (cut and thrashed)
1915 ..	15·55	Bare fallow
1916 ..	28·79	Sown with Federation wheat (stripped)
1917 ..	20·10	Bare fallow. Prior to ploughing, the samples shown in Figure No. III. were obtained
1918 ..	..	Sown with Yandilla King wheat

NOTE.—The yields from the wheat crops grown in 1914 and 1916 show that on this soil superphosphate was the most profitable fertilizer tested.

These weights, in the table above, show a gradual rise from almost nil on the unmanured plot up to 13.2 cwt. per acre on 19th July, and 34.8 cwt. on 7th September, on the plot which received 2 cwt. of superphosphate per acre. Similar results were apparent this year, though in a somewhat less marked degree. It will be noticed that the yield of the self-sown crop is in almost direct proportion to the amount of water-soluble phosphoric acid supplied to the previous crops. Fig. No. II., taken just before the self-sown crop was ploughed in on 17th September, gives some idea of the differences in growth on a few of the plots, but it is more clearly seen in Fig. No. III. In this illustration each small sheaf or bundle represents the average

growth on one square yard of each plot at the time the samples were taken on 7th September. The phosphoric acid in Thomas' phosphate (which is now practically unobtainable owing to the war) being in a less soluble form, the result from this fertilizer is not nearly so

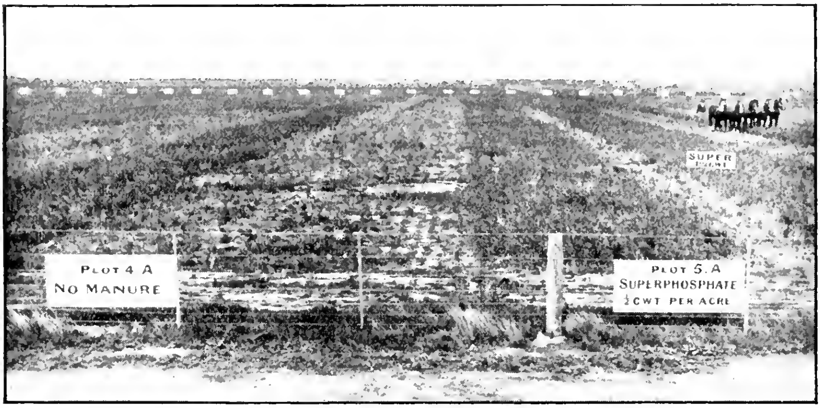
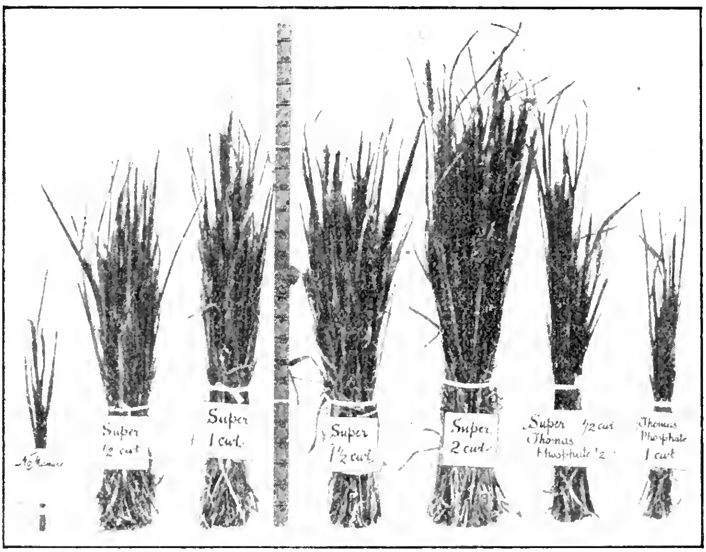


Fig. 2.—Showing the variation in growth of self-sown crop on a few plots.



5 cwt. 12·9 cwt. 17·8 cwt. 22·9 cwt. 34·8 cwt. 9·4 cwt. 2·6 cwt.

Fig. 3.—Self-sown Wheat.

(Each sheaf represents the average yield from one square yard.)

pronounced as that from superphosphate. *It will also be seen that the phosphoric acid contained in the latter has apparently neither leached out in the wet season experienced at the end of* 1916, *or reverted to a*

form unavailable to the rootlets of the wheat plant. Water soluble (mono-calcic) phosphoric acid is the form in which this plant food is readily available for the use of plants, and is, therefore, the most valuable to the farmer. On reference to the guaranteed analysis on the tags attached to bags containing superphosphate, it will be seen that by far the greatest part of the phosphoric acid which the fertilizer contains is soluble in water, and consequently immediately available to the plants. Its ready availability is demonstrated by the increased vigour and growth of the crop to which it is applied, practically from the appearance of the plants over ground. This point is well illustrated by the growth on the unmanured plot No. 4 (Fig. I.) as compared with that on the adjoining plot, which received only ½ cwt. of superphosphate per acre. Both plots were sown with Yandilla King wheat on 19th June, and the photograph was taken on 17th September following.

When applied to the soil, water soluble phosphoric acid quickly reverts (combines with lime, &c., in the soil) to forms less soluble, and

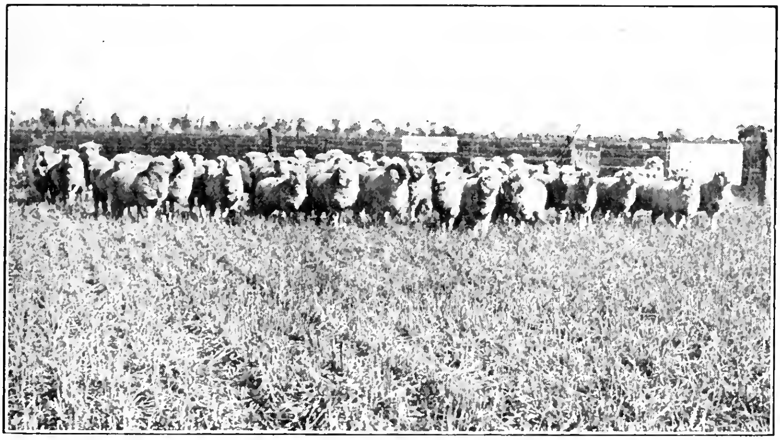


Fig. 4.—Green Manure Trials—Feeding off Cape Barley with Sheep.

therefore less available to plants, but probably this reversion does not occur till the phosphoric acid has become dissolved in the soil moisture. Assuming such to be the case, the plant food would be distributed through the soil, and in such a fine state of subdivision that, although reverted, it could still be utilized by the plants. In any case, the variation in growth shown in Fig. No. II., which is brought into sharp relief by Fig. No. III., and the weights recorded in Table No. 1, clearly indicates that there is a considerable amount of plant food still fairly readily available after the fertilized crop has been harvested.

Cash Value of Residual Benefit.

Close to the field where the results specified above were obtained is another experimental field, in which different crops are annually grown and fed off with sheep. The sheep are carefully weighed "in" and "out" of the plots, in order to estimate the grazing value of the crop on which they are pastured. No wheat is grown for this purpose, but

if the results from barley (which is of about the same feeding value) are compared with the yields of self-sown wheat in Table No. 1, the monetary value of the latter can be approximately assessed.

The average return for the past four years from the first "feed" each year on the Cape barley crops referred to is as follows:—

Weight of crop per acre.	Sheep Days.*	Increase in Live Weight.
55.9 cwt.	313.7	170.7 lbs.

Thus 1 cwt. of green barley would support a sheep for 5.6 days and increase its live weight by 3 lbs. Assuming that the grazing value of the self-sown wheat is equal weight for weight to that of barley, and calculated at the rate of 2d. per lb. for the live weight increase and ¼d. per day for the wool (both reasonable charges under prevailing conditions), the cash value of the wheat on the different plots would be as shown in Table No. III.

Table No. III.

Estimated Cash Value of Residual Benefit.

On basis of weight of crop on July 19th, 2d. per lb. live weight increase, ¼d. per day for wool, and assuming that wheat is of equal grazing value to the barley specified above.

Plot Number.	Fertilizer Applied to Wheat Crops in 1914 and 1916, per Acre.	Weight of Self-sown Crop per acre.	Cash Value, per Acre.	Increase per Acre Due to Fertilizer.
		cwt.	£ s. d.	£ s. d.
4A	Nil	0·3	0 0 2¼	..
5A	Superphosphate, ½ cwt.	4·1	0 2 6¼	0 2 4
10A	Superphosphate, 1 cwt.	6·5	0 4 0	0 3 9¾
6A	Superphosphate, 1½ cwt.	10·0	0 6 2	0 5 11¾
7A	Superphosphate, 2 cwt.	13·2	0 8 1½	0 7 11¼

On basis of weight of crop on September 7th, 2d. per lb. live weight increase, ¼d. per day for wool, and assuming that wheat is of equal grazing value to the barley specified above.

Plot Number.	Fertilizer Applied to Wheat Crops in 1914 and 1916, per Acre.	Weight of Self-sown Crop per acre.	Cash Value, per Acre.	Increase per Acre Due to Fertilizer.
4A	Nil	0·5	0 0 3½	..
5A	Superphosphate, ½ cwt.	12·9	0 7 11½	0 7 8
10A	Superphosphate, 1 cwt.	17·8	0 10 11¾	0 10 8¼
6A	Superphosphate, 1½ cwt.	22·9	0 14 1½	0 13 10
7A	Superphosphate, 2 cwt.	34·8	1 1 5½	1 1 2
15A	Superphosphate, ½ cwt. Thomas' Phosphate, ½ cwt.	9·4	0 5 9½	0 5 6
14A	Thomas' Phosphate, 1 cwt.	2·6	0 1 7¼	0 1 3¾

On the basis of the weights recorded on 7th September, Table No. III. shows that on three out of the four plots which received superphosphate only, the residual effect on the self-sown wheat crop was, in *one* year, sufficient to pay for the superphosphate applied to *two* crops of wheat. However, under practical working conditions the crop would probably have been stocked before this date, and the following figures worked out on the average weight of the two samplings would be more reliable as a

* The term "sheep days" means the number of sheep multiplied by the number of days they were on the plot, *e.g.*, ten sheep pastured for twenty days, or twenty sheep pastured for ten days, equals 200 sheep days. Thus 365 sheep days per acre is equivalent to one sheep to the acre for the whole year.

guide to what might be expected on farms with soil and climatic conditions similar to those at Werribee:—

Plot Number.	Superphosphate Applied per Acre to Crops in 1914 and 1916.	Cost per Acre at £5 per Ton.	Estimated Mean Cash Value of Residue per Acre on *One* Self-sown Wheat Crop.
		£ *s.* *d.*	£ *s.* *d.*
4A	Nil	..	..
5A	Superphosphate, ½ cwt.	0 5 0	0 5 0
10A	Superphosphate, 1 cwt.	0 10 0	0 7 3
6A	Superphosphate, 1½ cwt.	0 15 0	0 9 10¾
7A	Superphosphate, 2 cwt.	1 0 0	0 14 6½

While these figures speak for themselves, there are other factors to be taken into consideration. For instance, in dry districts the application of an excessive amount of fertilizer may force such a rank flaggy growth in early spring that all the available moisture is used, with the result that the crop wilts and grain "pinches" at the ripening period. On the other hand, a rational use of fertilizers enriches the soil moisture with plant food, and enables the plant to obtain a greater proportion from a given quantity of water absorbed. It is evident that in calculating the returns from the use of fertilizers, not only the immediate benefit to the crop should be taken into account, but also its residual effect on succeeding crops. Thus, the residual effect of heavy dressings, which do not show such a large immediate *net* profit as lighter ones, may, over a period of two or three years, warrant their use. The growth from the plots illustrated in Fig. III. occurs at a time when it is particularly useful for fattening early lambs. The results generally have a direct bearing on the returns from mixed farming where grazing enters into rotation with cropping, as they prove that the benefit derived by fertilizing the grain crop will be continued to the pasture which follows. This pasture, besides being greater in yield, will be of better quality, and will, in part, be returned to the soil, as manure, by the stock which it carries.

HERB GROWING.

By Edward E. Pescott, F.L.S., Government Pomologist.

In response to an inquiry as to the possibility of developing the herb-growing industry in Victoria, the following statement was recently made by a representative of a large wholesale house in Melbourne:—"We buy weekly 3 cwt. of herbs, for which we pay 1s. 6d. per lb, every ounce of it being imported from overseas."

Such a statement, from so reliable a source, is evidence enough that there are ample opportunities for the establishment of herb growing as a remunerative occupation.

Local dealers prefer home-grown herbs, and there is, apparently, a permanent market, especially for thyme, sage, marjoram, and basil.

Soil and aspect are the first considerations in establishing the herb garden. Almost any type of soil is suitable, but it will be well not to

choose one too rich, otherwise the herbs will make a rank growth, and the oil or flavour content will not be so extensive. The best results are obtained from land of a limey formation. Manuring is not necessary, and should generally be avoided, for it usually promotes too rank a growth. Thrifty and sturdy development of the herbs is more to be desired than coarse, weedy growth.

As protection from the cold westerly and northerly winds and also from the hot northerly winds is needed; an easterly or a south-easterly aspect would be the best.

If the soil be at all heavy and likely to remain wet during the winter, or if the subsoil be of stiff clay, the herb garden, not on a good slope, must be drained. This protects the plants from stagnation and possible rotting in winter; and as it also increases the winter soil-temperature, it allows for a quicker "get-away" of growth in early spring. Thus plants growing in an area where drainage has been considered, will start to grow earlier in the spring, and will, in consequence, produce a greater quantity of herbage in the harvesting season.

It is possible to grow most herbs from seeds, and these should be planted either in early autumn or early spring. Autumn sowing is, perhaps, preferable, as stronger and sturdier plants are then available for the coming spring.

Quicker, and some experts consider better, returns are to be obtained from planting out cuttings. In that case, the cuttings should be planted in early autumn. Root division from stools of such plants as thyme would again give much quicker results. The planting should be done in rows, keeping the rows at certain distances according to cultivation requirements.

If the plots are small, and hand cultivation the method, then the distance between the rows would be from 9 to 12 inches. If the area be large, and cultivation with horses resorted to, then the distance would be from two to three feet.

The distance between each plant should be from 9 to 12 inches in small areas, and greater distances in big areas.

It is an interesting and, at the same time, a most valuable factor in herb growing, that these economic plants are not subject to devastating pests. Grown under healthy conditions in suitable soil, and in a sunny position, they are not attacked either by insect pests or fungus diseases. Thus spraying, which is an important work with most economic plant life, is unnecessary. Further, the plantations need not be wire netted to keep out rabbits and hares, for they will not eat herbs. If stock should stray into the herb garden, they might do a little damage by trampling down the plants, but they certainly will not eat them. Indeed, it is an advantage to turn stock, especially sheep, into the plots at certain seasons, so that weeds may be kept down.

Every endeavour should be made to keep the plots clean, so as to insure the herbs being free from extraneous growth when harvested. From early spring until harvesting time, and even afterwards, the ground must be kept well tilled, either with the hoe or the horse cultivator. Weeds are notorious plant food and moisture robbers, and chickweed, capeweed, sow thistle, and dozens of other such plants, all thrive in cultivated areas. If they obtain a foothold, they work their way among the herbs, and when harvesting commences they, too, are garnered

with the herbs. Thus adulteration is the result, the herbs tainted with the flavours of the weed, and the sample, of course, decidedly inferior. It is too late to separate the weeds from the herbs after the crop has been cut; so that cultivation will be a stringent occupation in the herb garden.

With most herbs cutting should be done when the plants are in full flower. It would seem that at that time the principle or flavour for which the herbs are grown is at its highest stage of development or content.

The whole plant should be cut, a sickle or reaping hook being the most convenient implement to use. If the plants be cut almost down to the ground, they will readily make recovery, and be full of herbage next season. To attain this recovery, cultivation should immediately and regularly follow the cutting, so as to induce a good growth.

After cutting, the subsequent management of the crop requires both care and experience. First the herbs must be dried. The ideas of kiln drying and of sun drying must be abandoned, as excessive heat and sunshine will evaporate the oil or flavour content of the plant.

The crop should be dried in open, well-ventilated sheds, where, spread out on clean floors or on clean tarpaulins to a depth of not greater than a foot, it may be turned over daily with a hay fork, so that it may dry quickly and not ferment or go mouldy.

When thoroughly dry, it is flailed or threshed, so that the leaves are separated from the stems. Thoroughness is here necessary, for all the foliage should be removed.

Then the crop should be sifted, and perhaps sifted again, till the fine "herb" portions of the plant are separated from the stems and twigs. The finely-sifted herbage is then packed in bags or packages for the market. After sifting the stems should be burnt.

In imported samples it is often found that the stem portion of the crops have been crushed and finely broken up and included with the dried leaves. This is a great mistake, for in the stems and twigs there is no oil content; so that to add those to the marketable article will certainly much reduce its value.

If the grower is determined to produce only first class dried herbs, his venture will be more profitable than if he raises an inferior grade article. Further, his crop will have a readier sale if put up in clean-looking and attractive packages.

Lastly, I would urge upon intending growers that the necessity of creating a market first is a matter of urgency. Inquiries at wholesale places of business, either from butchers, or butchers' suppliers, will soon show the demand and the prices offered; thus growers will be able to estimate probable returns from the beginning.

There is another aspect of herb growing which may be considered—that of growing and selling the herbs green and fresh, in bunches. It would seem that there is only a limited sale of these, and the prospect of a good income from this form of herb growing is not a good one. Certainly, almost every seed and plant store has a constant sale for bunched herbs; but the demand is very small, as compared with the requirements of the wholesale and retail butchers, and it is to these that the grower must look for purchasers.

THE SUNFLOWER.

ITS CULTIVATION AND UTILIZATION.

By J. W. Audas, F.L.S., F.R.M.S., Assistant, National Herbarium, Melbourne.

The sunflower (*Helianthus annuus*) belongs to the natural order compositæ, and, in its native habitat, North America, it frequently covers large areas. It is a tall, showy, and large-flowered annual, familiar to all as an ornamental plant, but it is not without commercial importance, and numerous varieties have been developed. The best kinds to cultivate are those which produce a simple large head, 10 or 12 inches in diameter. Although the sunflower may be grown to perfection in many parts of Victoria, it has not so far been included in the general list of farm crops, but there is no reason why such a useful plant should not be cultivated advantageously in our State. It requires a fair amount of moisture, and should be successfully grown on irrigation farms; rich calcareous soils, or soils containing a large percentage of potash, are very suitable for its growth. Before sunflower cultivation could be put on a satisfactory commercial basis, the establishment of a mill for extracting the oil from the seed would be necessary. To encourage this useful and much-needed industry some capital would be required for plant, &c., and with the present enhanced value of oil, such an investment should return a handsome profit.

During recent years, the sunflower has been widely grown in Russia, Germany, Austria, Italy, Turkey, Egypt, and France, and, to some extent, in China and India, as well as in the United States, and the areas under cultivation are gradually being expanded. In Russia it is estimated that more than 1,000,000 acres are annually devoted to this crop. In South Africa, according to the Cape of Good Hope *Agricultural Journal* for 1908 (32, 85), 26 trials were made in 1907 with satisfactory results in all but three cases, and it was concluded that no reason existed for not extending sunflower cultivation on a commercial scale. In Queensland the plant is said to thrive well on the Darling Downs and on the eastern coast lands. Successful trials have also been made recently at the Moumahaki Experiment Station in New Zealand (*Journal of Agriculture*, New Zealand, 1915.11.233). In the United States numerous trials have been successfully carried out, but sunflower seed does not appear to have been produced there on a commercial scale. At the New Hampshire Experimental Station, according to Piper, three varieties gave the following yields of heads to the acre:—Russian, 23,958 lbs.; White Russian, 19,360; and Grey, 20,812. At the Ontario Agricultural College three varieties have been grown continuously for a period of years, the resulting yield being as follows:—

Varieties.	Average Diameter of 25 Heads, 10 Years.	Average Height, 13 Years.	Average Yield to the Acre.		
			Heads, 13 Years.	Whole Crop, 13 Years.	Grain, 12 Years.
	inches.	inches.	tons.	tons.	bushels.
Mammoth Russian ..	7·29	100	5·97	18·05	74·7
White Beauty ..	7·38	87	5·60	16·18	74·4
Black Giant ..	7·08	107	6·32	22·36	72·0

According to the latest American census the total area of cultivated sunflower was 4,731 acres, which yielded 63,677 bushels of seed; Illinois, with 3,979 acres, produced most of the crop, viz., 49,064 bushels.

Cultivation and Harvesting.

In growing sunflowers for oil production, those varieties producing medium-sized seeds in thin shining husks are the best to sow, as seeds of the very large-growing varieties are pithy inside, and absorb a large portion of oil when pressed. The latter kind, however, make excellent feed for poultry and cattle. The three principal varieties of sunflower now cultivated are:—

1. Those having large white seeds and producing a good percentage of oil.
2. A smaller black-seeded kind, the seeds of which are sweeter and regarded as best for eating in Russia.
3. An intermediate sort, with striped seeds, which is an excellent oil producer.

The seeds may be grown any time between October and January, about 8 lbs. to the acre being required. The Russians, who cultivate the sunflower extensively, sow the seed generally after a crop of wheat has been harvested from the land. The land intended to be planted should be thoroughly ploughed in the autumn and left until the next spring, when the seeds should be sown. On some of the rich black lands from four to six crops are grown without resting the land. It is stated in Russia that the stalks and leaves of one crop, if left on the land, will manure the soil sufficiently to yield six more crops consecutively, without additional fertilizing. The roots of the stalks soon rot in the ground, and leave about one ton of manure per acre in the soil. In the warmer parts of Australia, two consecutive crops could be grown on the same land, provided that the soil is suitable. To obtain the best results, sunflowers should be sown in drills 3 feet apart to admit of cultivation, and when the plants are about 9 to 12 inches high they may be thinned out to a distance of 12, 18, 24 inches, according to the variety. In light soils it is advisable to sow the seed 2 to 3 inches deep, so that it may obtain sufficient moisture to permit it to germinate; in heavy soils it should not be sown too deeply. In favorable weather germination will readily take place, and the seedlings will soon appear above ground. When the plants are well discernable in the rows, it will be advisable to put a scarifier over the ground to prevent the growth of weeds. This operation should be occasionally repeated until the plants are about 18 inches high, and from then they will require little or no attention until harvest time. When the seeds have become quite ripe they are so thickly set that as many as 1,000 or 2,000 find place in a single head. They are slightly wedge-shaped, and vary in colour, some being quite black, whilst others are grey or white-streaked with black. When matured, the heads should be cut off the stems, and laid on a floor or any clean, hardened surface which is exposed to the sun. The seed heads should not lie too thickly, and they should be turned over occasionally and protected from rain and heavy dews. In ordinary summer weather, not many days will be required to dry the heads sufficiently to enable the seed to be separated from them. After the seeds have been thoroughly dried and cleaned by winnowing, &c., they may be stored in

a cool, dry place until marketed. It is essential that they should be thoroughly dried before storing, otherwise they will not keep well, and will tend to become mouldy. Experimental growths made in this State show that an acre of well-cultivated sunflowers will yield from 50 to 60 bushels of good seed, from which could be obtained as many gallons of oil of a quality little inferior to that of olive. Sunflower oil is a clear, pale, yellow, limpid oil, with scarcely any smell and a mild, pleasant characteristic taste. The oil is highly valued for its dietetic as well as illuminating properties.

Value as a Stock Food.

The nutritive value of sunflower oil-cake as feed for cattle is recognised. The dry method of sprinkling the meal upon roots, straw, or chaff is, on the whole, preferable. The oil-cake of sunflower is so hard that the cattle find difficulty in chewing the larger pieces, and for this reason it is considered advisable to grind it before use into a fine meal, in order to make it more digestible. It is recognised as a suitable food for increasing the supply of milk in milch cows, and it is used also with horse feed with good results. Decorticated sunflower seed-cake forms a nutritious food for live stock, although containing a rather high percentage of fibre. The cake made from undecorticated seed is naturally less valuable, the fibre percentage being high. Analyses of the two kinds of cake, according to Smetham (Ann. Roy. Lancs. Agric. Soc. 1914), are shown in the following table, compared with cakes used in Britain:—

—	Moisture.	Crude Proteins.	Fat.	Carbo-hydrates, &c.	Crude Fibre.	Ash.	Nutrient Ratio.	Food Units.
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.		
Sunflower-seed cake, undecorticated	7·10	19·01	7·43	28·93	30·03	7·50	1:2·42	95
Sunflower-seed cake, decorticated ..	7·75	38·38	8·68	22·46	16·03	6·70	1:1·11	140
Linseed cake, English made, average	11·16	29·50	9·50	35·54	9·10	5·20	1:1·94	133
Cotton-seed cake, decorticated, from Atlantic Ports	7·40	42·37	10·16	25·86	7·06	7·15	1:1·16	157
Cotton-seed cake, undecorticated, English made	13·75	24·62	6·56	29·28	21·19	4·60	1:1·67	107
Cocoanut cake, English	8·5	24·5	8·3	38·8	12·8	6·1	1:2·42	122
Palm kernel cake, English ..	12·0	18·5	5·5	50·0	10·0	4·0	1:3·39	110

Sunflower seed-cake is produced in large quantities in South Russia, and is principally exported to Denmark, where it is a popular cattle food, and also to Sweden, France, and Norway. That large quantities of the cake are sent to important cattle-rearing countries should be sufficient to show that sunflower seed-cake is worthy of trial. The cake is well adapted for dairy cows in quantities of about 3 to 4 lbs. per day; larger quantities would be likely to impart an unpleasant flavour to the butter.

Sunflower Silage for Dairy Cows.

An interesting experiment was carried out at the Agricultural Experiment Station, Bozeman, Montana, in the spring of 1915 (Bulletin No. 118). A small area was seeded to Giant Russian Sunflowers. Under irrigation the yield per acre was approximately 36 tons of green

material. The crop was tested in a limited way as a soiling feed for dairy cows to supplement the pastures, and also as ensilage. Encouraged by satisfactory results obtained, some 3 acres were seeded to sunflowers in the spring of 1916. They were planted in rows 28 inches apart at the rate of 20 lbs. per acre. The crop was cultivated, not irrigated. A portion of the field was cut and fed to dairy cows as a supplement to the pasture during the latter part of the grazing season. The sunflowers so used were first run through a feed cutter. The cows ate the green sunflowers readily, consuming from 40 to 90 lbs. per head daily, kept up the milk flow, and apparently did well on the feed. The green sunflowers were fed in comparison with green corn, and the results indicated that the sunflowers and corn were of equal feeding value pound for pound. Only about 5 per cent. of the sunflowers were in bloom, so there was no seed or grain in either case.

The remainder of the crop was harvested after the first hard frost, and yielded 22 tons per acre. The percentage of bloom was approximately the same as stated above. An ordinary ensilage cutter was used in filling the silo. The ensilage was in first-class condition when the silo was opened in March, and in practically all cases it was eaten with relish at first feeding. In a few cases it required several days to accustom the cows to the change from the oat and pea ensilage. In order to determine the relative value of ensilage made from sunflowers, two lots of cows were fed. Each lot contained seven cows, as nearly equal as possible in breed, age, weight, condition, period of lactation, pregnancy, milk production, and fat test. Lot 1 received grain and clover hay, and lot 2 grain, clover hay, and sunflower ensilage. The grain fed was a mixture of oats, 5 parts; malt sprouts, 2 parts; and bran, 3 parts. The clover used was choice alsike. At the end of 28 days the lots were reversed, and lot 1 was fed with grain, clover hay, and sunflower ensilage, and lot 2 grain and clover hay for 28 days. This change was made to eliminate as far as possible variations due to individuality among the cows. A preliminary feeding period of seven days was given at the beginning of each period of the experiment in order to accustom the animals to the change of feed. Individual weights were taken three days from the beginning, and at the close of each period, and the averages of these weighings were taken as the initial and final weight. Individual records of milk produced and fat tests were used in order to determine the production. In order to simplify the discussion of results, the data obtained from lots 1 and 2, while fed grain and clover hay, are combined in one table. Likewise, the data obtained while they were fed grain, clover hay, and sunflower ensilage are combined.

Table 1, giving the data for the period when only grain and clover hay were fed, shows that fourteen cows gained a total of 155 lbs., or an average of 11 lbs. per cow, during the 28-day period. The fourteen head consumed 5,140 lbs. of grain and 8,243 lbs. of clover hay, which is practically a daily average of 13 lbs. of grain and 21 lbs. of clover hay per cow. The total production during the period was 13,084.6 lbs. of milk and 542 lbs. of fat, a daily average of 33.37 lbs. of milk and 1.382 lbs. of butter fat per cow.

The data presented in table 2, covering the period when grain, clover hay, and sunflower ensilage were fed, show that fourteen cows gained

a total of 81 lbs., or an average of approximately 6 lbs. per head during 28 days. The fourteen head consumed a total of 5,134 lbs. of grain, 4,778 lbs. of clover hay, and 13,182 lbs. of ensilage, which is a daily average per cow of approximately 13 lbs. of grain, 12 lbs. of hay, and 34 lbs. of ensilage. The total milk production was 13,464.8 lbs. and 571.92 lbs. of butter-fat, which is an average of 34.35 lbs. of milk and 1.459 lbs. of butter-fat per head daily.

Table 1.

Data for Lots 1 and 2 while on Ration of Grain and Clover Hay.

(Result in Pounds.)

Cow No.	Initial Weight.	Final Weight.	Total Feed Eaten.		Average Daily Feed Eaten.		Milk.		Fat.	
			Grain.	Hay.	Grain.	Hay.	Total 28 days.	Daily Average	Total 28 days.	Daily Average
1	802	817	327	414	11·6	14·7	625·4	22·33	39·18	1·399
2	827	845	287	497	10·2	17·7	624·0	22·28	32·75	1·169
3	1,220	1,248	476	684	17·0	24·4	1,432·4	51·16	47·63	1·701
4	1,189	1,230	441	689	15·7	24·6	1,212·1	43·29	53·81	1·921
5	1,219	1,280	441	692	15·7	24·7	1,170·5	41·80	41·78	1·492
6	1,144	1,137	357	461	12·7	16·4	808·5	21·73	33·37	1·192
7	1,034	1,034	293	554	10·4	19·7	903·3	32·26	33·39	1·192
8	826	816	280	470	10·0	16·7	639·2	22·82	39·09	1·396
9	713	700	168	371	6·0	13·2	428·3	15·29	21·91	0·782
10	1,149	1,144	474	669	16·9	23·8	1,314·9	46·60	54·85	1·958
11	1,151	1,134	448	670	16·0	23·9	1,099·7	39·29	43·09	1·538
12	1,309	1,324	392	710	14·0	25·3	987·5	35·26	32·04	1·144
13	1,259	1,281	336	690	12·0	24·6	783·4	27·97	25·37	0·906
14	1,161	1,168	420	672	15·0	24·0	1,055·4	37·69	43·74	1·562
Total ..	15,003	15,158	5,140	8,243	..	..	13,084·6	..	542·00	..
Average for One Cow	1071·6	1082·7	367·1	588·7	13·0	21·0	934·6	33·37	38·71	1·382

Table 2.

Data for Lots 1 and 2 while on Ration of Grain, Clover Hay, and Sunflower Ensilage.

(Result in Pounds.)

Cow No.	Initial Weight.	Final Weight.	Total Feed Eaten.			Average Daily Feed Eaten.			Milk.		Fat.	
			Grain.	Hay.	Silage.	Grain	Hay.	Silage.	Total, 28 days.	Daily Average	Total, 28 days.	Daily Average
1	833	838	308	260	795	11·0	9·2	28·3	590·0	21·07	50·35	1·798
2	855	860	252	273	765	9·0	9·7	27·3	597·7	21·34	31·04	1·108
3	1,249	1,232	476	388	1,227	17·0	13·8	43·8	1,343·1	44·39	59·01	2·107
4	1,238	1,268	420	389	1,248	15·0	13·8	44·5	1,132·2	40·43	47·54	1·698
5	1,275	1,260	420	388	1,251	15·0	13·8	44·6	1,066·6	38·09	39·68	1·417
6	1,125	1,138	336	279	822	12·0	9·9	29·3	733·9	26·21	27·05	0·966
7	1,061	1,068	306	331	1,085	10·9	11·8	38·7	809·3	28·90	33·03	1·179
8	822	825	301	367	431	10·7	13·1	15·3	712·0	25·42	41·46	1·180
9	735	701	213	216	235	7·6	7·7	8·3	483·1	17·25	22·79	0·814
10	1,151	1,155	450	397	1,117	16·0	14·1	39·8	1,574·5	56·23	56·27	2·009
11	1,142	1,145	469	382	996	16·7	13·6	35·5	1,229·5	43·91	46·96	1·677
12	1,282	1,303	427	390	1,130	15·0	13·9	40·3	1,119·4	39·97	44·78	1·599
13	1,217	1,242	336	327	1,077	12·0	11·6	38·4	924·1	33·00	30·01	1·071
14	1,145	1,176	420	391	1,003	15·0	13·9	35·8	1,149·4	41·05	41·95	1·498
Total ..	15,130	15,211	5,134	4,778	13,182	..	..	..	13,464·8	..	571·92	..
Average for One Cow	1080·7	1086·5	366·7	341·2	941·5	13·0	12·1	33·62	961·77	34·35	40·851	1·459

Table 3 gives a brief summary of the entire experiment. The figures show that fourteen cows, while receiving the ration of grain and clover hay, gained on the average 5 lbs. more per head in 28 days than while they received the ration containing sunflower ensilage. The grain ration was the same throughout the entire experiment, and an average daily feed of 34 lbs. of sunflower ensilage effected a daily saving of 9 lbs. of clover hay per cow. There was a slight increase in production while the cows were receiving the sunflower ensilage. This increase amounted to 0.98 of a pound of milk and 0.077 of a pound of butter-fat. This difference was too small to be of significance, except as indicating that there was no reduction in milk or butter-fat production due to the feeding of sunflower ensilage in place of a part of the clover hay in the ration. The data presented indicate that under the conditions of this experiment 1 lb. of choice clover hay is equal to $3\frac{3}{4}$ lbs. of sunflower ensilage.

TABLE 3.

SUMMARY OF EXPERIMENT.

—	LOT ONE. Grain and Clover Hay.	LOT TWO. Grain, Clover Hay and Sunflower Ensilage.
Number in each lot	14	14
Days on test	28	28
Average initial weight	1,072	1,081
Average final weight	1,083	1,087
Average gain for period	11	6
Average daily grain per head	13	13
Average daily clover hay per head	21	12
Average daily sunflower silage per head	..	34
Average daily milk per cow	33·37	34·35
Average daily butter fat per cow	1·382	1·459

The milk from cows fed with sunflower was sampled and tested for flavour, but no objectionable flavours or change in the milk could be detected.

Uses of the Sunflower Plant.

A fair quantity of ensilage may be prepared from the whole plants, but the stems and leaves alone would be less nutritive. The dry stems contain nearly 5 per cent. of their weight in potash, and if chopped up fine and used as manure they would be a useful source of potash, in addition to supplying humus and a small amount of phosphoric acid and nitrogen to the soil. The fibre of the stalk yields a fairly tough, opaque, parchment—like paper of fair quality. By treating the stems of the plant in the same way as European flax, a very fine fibre, nearly as fine as silk, is produced. The entire mature plant in a fresh state has the following composition (*Bulletin* of Imp. Ins., vol. XIV., No. 1, 1916) :—

	Per cent.
Moisture	85.21
Fat	1.03
Crude proteins	1.70
Carbohydrates, &c.	6.14
Fibre	4.00
Ash	1.92

Uses of Sunflower Seed.

The oil obtained by expression from the seeds is the most important product of the sunflower, and is valuable for many purposes. The chief industrial uses of the oil are for woollen dressing, in paints, illumination, and candle and soap making; for the latter purpose it is superior to most oils. When properly treated it is used on the most delicate machinery as a lubricator. Cold pressed oil from seed of good quality is almost tasteless, and the better grades of oil are consequently suitable for use in the manufacture of butter substitutes, for culinary purposes, and as a salad oil. Druggists use the refined oil in perfuming linaments, salves, and hair lotions. It may also be used in the making of demulcent and soothing emulsions. Roasted and ground, the seeds are used as a substitute for coffee, and a fine sweet bread may be made from the flour of the seeds. In parts of Russia the seed is preferred for consumption, as the peanut is treated here. In some parts of Europe a bouillon is made of them which is used as food for infants. The seeds usually consist of about equal proportions of husk and kernel; the husk being tough, fibrous, and rather absorbent, should be removed before expressing the oil. The weight of a bushel of sunflower seed varies from 25 to 35 lbs., according to the quality of the seed, but 30 lbs. may be taken as a fair average.

The composition of the seeds and kernels is shown in the following table (Wiley, loc. cit. 27) :—

	Seeds. Per cent.	Kernels. Per cent.
Moisture	4.43	4.89
Fat	27.08	45.21
Crude proteins	14.97	26.85
Carbohydrates, &c.	20.94	16.06
Crude fibre	29.17	2.67
Ash	3.41	4.32

The sunflower is a good bee plant, and when in bloom yields a large amount of honey and pollen. Few economic plants are more valuable than the sunflower, and it would appear to deserve greater attention for commercial purposes than has so far been accorded it in the Commonwealth.

TURKEY BREEDING.

Hints to Beginners.

By A. Hart, Chief Poultry Expert.

Though turkeys can be reared in any part of Victoria, they are very susceptible to cold, and consequently thrive best in the northern districts, where, in addition to the advantages of warmer weather, there is an abundance of insects, and, in many places, of thistles. Turkey rearing can be carried on most easily and profitably on large farms, for if given a free range of a wide, rich pasture, the birds will find most of their own

feed. Probably they will mature best on heavy soils, especially in ironstone districts. The rearing of turkeys should be found a profitable adjunct on a farm where lucerne is grown, for if allowed to stray in a lucerne crop they will not require much hand-feeding. The turkey is a rather unsociable bird, and will do better if reared apart from other kinds of poultry.

The breeds recommended are Black Norfolk and the American Bronze. Though the Black Norfolk is not raised here to any extent, it probably would be found the better kind for trade purposes. The young birds mature quickly, and are fit for the market when two months younger than those of other breeds. They are small in bone, and their flesh is very fine in texture, and they are much sought after in the London markets. The American Bronze is the only variety of turkey now common in Victoria, most of the other breeds having been allowed to die out. This turkey, however, is really too large and coarse for the table. Gobblers from 20 to 28 lbs. in weight are the most suitable for stud purposes, and, further, are the best to insure fertility in the flock. Probably hundreds of turkeys are lost every year owing to farmers running small hens with gobblers 30 to 40 lbs. in weight.

When commencing turkey-raising, the male stock should be taken from second-season birds, and the hens should be of not less than 12 lbs. in weight. There should be one gobbler for every eight or ten hens.

Housing, etc.

It is essential that a high, dry spot be selected for the roosting-place. Heavy saplings make the best perches, and they should be placed about 5 feet from the ground. If more than one perch is erected, they should be about 2 feet apart, and care must be taken to have the various perches at an uniform height. The roosting-places should be covered by thatched roofs, or, at least, sheltered by trees. In a district where there are foxes the erection of a fence around the roosting-place is necessary. The area to enclose may, of course, vary according to circumstances, but it should be at least 100 feet long and 25 feet wide, so that the birds may be able to move about during the time between leaving their perches and being released for the day. Wire netting will probably be found the most suitable material for the fence, which, to be serviceable, must be not less than 6 feet high. A barb wire projecting 6 inches outwards should be run along the top. It would be advisable, where possible, to sow the enclosure down with rape, to provide green feed for the adult birds and protection from the sun for the young ones.

If it is intended to breed turkeys in a large way, a shed should be erected for them. No fixed size of shed can be laid down. It should, however, be about 3 ft. 6 in. wide and about 3 feet high in front and 2 ft. 6 in. at the back. The shed should be subdivided into 4-ft. compartments, with a 2-ft. door to each, the remainder of the front of the building being covered with 2-in. mesh wire.

Care of Sitting Turkeys.

A turkey hen can be induced to sit at any time by giving her a tablespoonful of port wine, and then placing her in a barrel or packing-case with a sack thrown over the entrance. When broodiness develops the

bird should be transferred to a nest on the ground. The best material of which to make nests is pine needles, as these will not harbor vermin as straw does. The nest should be protected from the hot sun and the rain and cold winds. The sitting hen should be removed from the eggs once a day, so that she may be fed and have a dust bath, the latter consisting of wood ashes, sand, and sulphur. It would be well to dust both the sitter and her nest occasionally with some material that will destroy lice. The powder known as "Pestend," which consists largely of tobacco dust, is recommended. If the hen be treated properly she will bring out two or three hatches if required. Better results will be obtained if, during the last five days of incubation, the eggs are placed in an incubator instead of being left under the hen.

Treatment of Young Turkeys.

The chicks do not require any food the first day they are hatched. On the second day they should be given some rice that has been boiled in milk. The best way of feeding the rice is as follows:—After boiling dry it off with raw oatmeal, and mix with it some fine chaffed green stuff, such as lucerne, milk thistles, rape, or cape-weed, and hard-boiled eggs in the proportion of one for every ten chicks. Add a teaspoonful of powdered charcoal, and give to the chicks in a crumbly condition. If possible, new milk should be given to the baby chicks for the first two days at least.

When they are a fortnight old they may be fed on a mash, as follows, which is also suitable for the adult birds:—One part pollard, two parts bran, and one part ground wheat, mixed with soup made from liver, rabbits, &c., chaffed green stuff being added later. This mash should be fed to the chicks in a crumbly state at least four times a day.

When the birds are about ten days old, eight of the leading flights should be pulled from each wing. The object of this operation is to help to conserve the strength of the chicks' bodies, as a certain amount of blood is required to support the growing flights. This operation will give extra strength to the growing birds for five or six weeks, and it should always be carried out, for in its first few weeks the turkey is very delicate, and needs every possible attention. During this period the chicks must be carefully protected from cold, bleak winds, and on no account should they be given their liberty unless the weather is favorable.

Spring onions or shallots make fine feed for young turkeys, and will hasten their growth and improve their health. From the time they are hatched turkeys should have a regular supply of charcoal, and a little fine sand should be given to the young chicks. Milk curds, either by themselves or mixed with pollard and bran, are essential if the best results are to be obtained.

When the gobblers are fourteen or sixteen weeks old they should, where practicable, be caponized. Otherwise they should be separated from the breeding flocks, so that strong chicks from the stud birds will be insured for the following season.

THE CARRYING CAPACITY.

GRASS ON THE WESTERN PLAINS.

By E. W. Murphy, Dairy Supervisor.

The development of primary production, at all times a national necessity with us, should now be stimulated more than ever. Therefore, any suggestion to increase the carrying capacity of our pastures deserves attention. There is undoubtedly room for improvement in this respect, especially in those districts where complaints of the stock being very unthrifty are commonly heard, and in which considerable losses have occurred. "All flesh is grass," but all grass does not produce good flesh nor all soils yield good grass.

Varied experiences in different parts of Victoria developed in myself a strong interest in the relation between soils and grasses, and almost everywhere I believe that grass, as a crop, is very much neglected.

It was strange, indeed, to hear Western plainsmen complain bitterly of "too much grass." Strong store sheep put on paddocks waving with grass, instead of growing fat, become poor and weak. Yet on pastures in the Gippsland hills and gullies, which at a glance appeared somewhat similar, the flock thrived splendidly. In the first case, however, an examination showed that the feed consisted of harsh native grasses, while in the Gippsland districts it was cocksfoot, cow-grass, and red and white clovers, thus showing that the trouble was due to the *quality* of the feed.

To double the number of blades of grass was said to be a work deserving high praise. On many thousands of acres in the Western Districts the number is ample, but the quality unsatisfactory. Our native grasses are, of course, very adaptable to soil defects, *i.e.*, lack of phosphoric acid and of lime, but where both these requirements are absent, the pastures are certain to be poor in quality. If a farmer has by any means encouraged the spread of a deep-rooting plant, yielding an adequate amount of essential digestible nutrients, fertility will then be brought from the subsoil and spread on the surface by the stock, and a new lease of life given to the farm.

False hopes have been raised by extolling a new grass "which will grow anywhere." If the worth of the plant is based on its depth of rooting or its power to assimilate plant foods from more or less refractory compounds, it is worthy of attention, but if it will grow equally well with or without certain elements, it will surely lead to disappointment. Paspalum dilatatum is adaptable, and *grows* well in many parts, hence the divergence of opinion among graziers regarding its feeding value. If allowed, it grows upright like oats, but if cropped closely the stems will grow along the ground, so that, notwithstanding adverse circumstances, the seeds may still be matured.

Where the complaint of "too much grass" is heard, there has generally been long-continued stocking, causing the predominance of shallow feeding grasses of inferior composition. In all stock farming, unless foodstuffs are brought in or mineral fertilizers employed, the fertility of the soil must decrease. Overstocking, in the first place, kills out the most nutritious herbage, and long-continued stocking renders the surface soils suitable only for comparatively worthless grasses. Necessarily, the time required to deplete the soil will vary according to its original endowment.

The greater portion of the body of a plant comes from the atmosphere, and the supply is boundless. The mineral matter can only come from the soil, and if one element be deficient there arises a constitutional weakening that renders the plant liable to disease. Dr. E. B. Forbes says, "No one who is interested in plants, or animals, or people can afford not to know how these dead ashes of the earth become involved in those wonderful processes which we know and experience as life."

The health and vigour of grass depend upon complete nutrition. Soil conditions most favorable for grass also embrace those most favorable for that form of life which plays a very important part in the fixation of nitrogen from the air. We may often notice how the nice sheeny grass about a homestead bears close grazing, whilst a little further away the pasture is lighter in colour, much longer, and neglected by the stock. The concentration of plant food about the centre makes all the difference. Here it may be overstocked, yet the grass does not die out. A farmer once told me that he had no faith in top-dressing, and explained that he had top-dressed 20 acres, and there was less grass on that area than elsewhere in the paddock. This was certainly so, but it was because the cattle had grazed the top-dressed portion of the farm and neglected the other part, notwithstanding its long, abundant grass.

A worthy farmer should aim at obtaining the maximum returns, while every year making his farm better than he found it.

The exploiter of the soil has found by experience that his stock will thrive better if he burns the old grass. The reason is that the fire destroys various enemy pests, and the ashes give a supply of desirable mineral elements, and the young, tender shoots are more digestible. Firing the grass may be wise as a temporary expedient, but if carried out too often it will bring in its own revenge.

Life involves unceasing resistance or warfare against the invasion by lower forms of life. Acidity of the soil favours the increase of fungi, and prevents the growth and activity of the nitrifying bacteria. The cells of the plant growing on the depleted, sour soil have a low resistance, and the fungi are allowed to spread on the grass. On such areas troubles of many kinds appear—paralysis, liver disorders, worms, and inflammatory conditions. The immediate cause is some micro-organism or parasite, but the underlying cause is bad management—the result of permitting the animals "too much *inferior* grass."

Milch cows will not thrive on these faulty native grasses. If a liberal ration of some food high in essential minerals, such as lucerne, linseed meal, bran, or crushed grains and a suitable mixture of salts be added to the ration, they will do better, but still there is the danger of paralysis being caused by action of the fungi which infest the grass. Fencing off surface catchment waters and providing well or bore water has made a marked improvement on many farms and on some runs.

Research has been carried out in South Africa by Sir Arnold Theiler with a view to ascertaining the cause of Lamziekte, which occurs among stock on sour veldts. Results, so far as grass is concerned, discount the importance of the "Shortage of Vitamine" theory. The experimenter believes the cause to be the accumulation in the animal system of grass-toxins. He aims at promoting oxidation, but his treatments so far, he admits, are only experimental. It is, he says, a question rather for the farmer than for the veterinarian. The food supply must be

improved, and the extensive system of stock raising give way to more intensive forms.

Wherever practicable, old grass land should be turned over so as to bury pests, and bring up a practically new supply of mineral nutrients for the grass, and then lambs will frolic again where they had ceased to thrive. The growing and feeding off of green crops, and the use of a basic phosphate, will effect a surprising improvement in the wholesomeness of the run, and greatly increase the "carrying capacity."

In a district with a heavy rainfall, where the soil is of a close, impervious nature, drainage must be considered. In cultivated paddocks, where no heed is paid to the natural slopes, and where the lands are flat-ploughed and badly finished, adverse soil conditions are certain to arise. Fairly narrow lands, well crowned, with the finishes cleaned out, to which a basic phosphate has been applied, have given decided satisfaction on some holdings near the foot of the Grampians. When a soil is water-logged, the development of acids and grasses is detrimental to the grass, even after the water has sunk below the level of the roots, while such conditions may favour the growth of toxic plants.

In any country where the grass is unsatisfactory, I would urge the following treatment:—Harrow it, and top-dress it with 2 cwts. per acre of phosphate. If sour, lime it, or, at least, use a basic phosphate. Drain as far as practicable. Introduce good plants, and regulate the grazing so that they will not be eaten out.

HINTS ON WEED CONTROL.

By H. W. Davey, F.E.S.

Weeds are often referred to as plants out of place. They certainly are plants that intrude themselves where they are least wanted, and their persistence and power to hold their own in competition with other plants is well known to most people.

In spite of all that has been written and spoken as to the great losses suffered by agriculturists through weeds, little is done to eradicate them.

Weed seeds are often introduced as impurities among other seeds, and, through carelessness, these are sown with the good seed, and so a weed is introduced to land previously free from that particular plant. Seeds are also spread in many other ways, the chief agencies probably being travelling stock, birds, irrigation water, trucks in which stock have been carried, stable manure, chaff and hay, and threshing machines, the latter being the most likely to carry weed seeds from one farm to another.

To enable one to successfully cope with a weed a knowledge of its life period and habits is necessary, inasmuch, for instance, as while an annual plant may be eradicated by not allowing it to seed, a perennial plant cannot be got rid of in this way.

Cultivation is a great factor in the control of most weeds, and especially so in the case of annuals.

In fallowing land, we have a means of killing weeds and their seeds, as can be seen by the millions of tiny plants that are destroyed every time the cultivator breaks afresh the crust of the soil. These seedlings

die on exposure to sun or wind, and each fresh cultivation of the soil brings more seeds within the influence of warmth and air, thus inducing germination, and further cultivation is then necessary to destroy these late growths. On the other hand, if cultivation be not carefully carried out it may spread such plants as Canadian Thistle and St. John's Wort, for small pieces of the roots of such weeds are each capable of forming new plants, and the harrows, in dragging these about, may easily start a fresh patch.

Seeds deeply buried often remain dormant for very long periods, so that deep plowing sometimes buries many seeds too deeply in the ground for germination to take place immediately, but they will germinate when subsequent plowings bring them to, or near, the surface.

Cultivation for the suppression of perennial weeds must be frequent enough to stop the formation of leaves, thus preventing the elaboration of crude sap sent up by the roots, and then the plant will be gradually suffocated and will die. Plowing should be of varying depths, so that all the roots may be brought to the surface to enable wind or sun to dry them out.

One of the chief means of controlling weeds, especially perennials, is to stop the development of seeds. This may be achieved in many ways, such as by mowing the plants, hand-pulling, or by digging them out. Heavy stocking with sheep or goats when the plants are young is often effective. The planting of strong-growing crops to smother weeds has also proved useful. Where it is found impracticable to employ these methods, chemicals can be used effectively to destroy all growth above the ground. Small patches of very persistent weeds can be killed by covering them with heavy mulchings of straw, sheets of bark, sheets of heavy paper, or, in fact, any material that will exclude all light from them, it being impossible for any plant containing chlorophyll in its leaves to exist in total darkness.

The best time to attack weeds by mowing them is just before they come into full bloom. This is especially so with annuals and biennials, as at this time their roots are more or less exhausted, their reserves having been fully drawn upon to enable them to reach the flowering period.

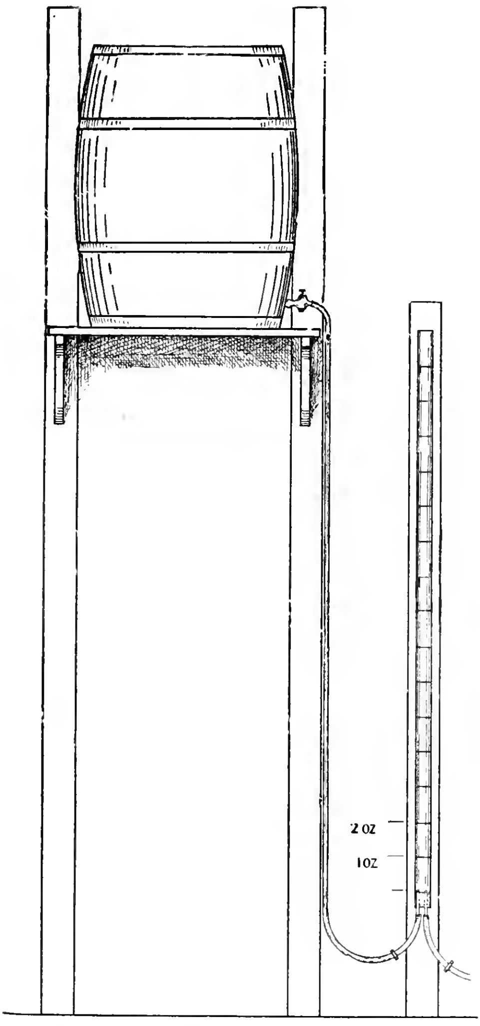
In the case of perennials this exhaustion is not so pronounced; still the check administered by destroying all top growth at this stage, either by mowing or by the application of chemicals, is severe, particularly so when the latter means are adopted. Chemical sprays should be applied during warm weather, care being taken to see that all parts of the plant above ground are touched by the mixture. Special attention must always be given to insure that the collar of the plant receives its full share of the material.

There is no royal road to weed control, but if land-owners decided on concerted action much could be achieved, for the hope of success lies more in practical work than in thinking over such matters. They should always be alert to prevent weeds spreading from their strongholds into clean country. This can only be effected by vigilance and promptitude in combating fresh patches as soon as they make their appearance. If nothing is done to check them, they will shortly increase to formidable proportions, and the cost of their eradication later on must be proportionately increased.

DRENCHING SHEEP.

W. A. N. Robertson, B.V.Sc., Chief Veterinary Officer.

The drenching of a large number of sheep is a somewhat laborious operation, and consequently the work is often postponed to some indefinite date.



The accompanying illustration, from the *Journal of Agricultural Research*, shows a device which was constructed by Mr. Maurice C. Hall, formerly Assistant Zoologist in the Bureau of Animal Industry, U.S.A. The gradations on the glass tube have been adapted to suit Australian conditions.

A solution of the medicament to be used is placed in the small water-tight keg. Near the bottom is a small tap, to which is attached one end of a length of rubber tubing; the other end is attached to one of two glass tubes passing through a cork in the bottom of a glass cylinder. Another rubber tube, which terminates in a metal or wooden nozzle, is attached to the second tube in the cork. The glass cylinder is graduated into ½-ounce and 1-ounce divisions. Close to the bottom of the cylinder two pinch controls are placed on the rubber. By pinching the control on the rubber tube coming from the keg the cylinder fills with the medicine; by closing this control and pinching the other, the solution flows from the cylinder in any dose required. The nozzle is held in the sheep's mouth by one man, and the controls are operated by another.

By catching the sheep and bringing them to the administrator, Mr. Hall found that he could dose 100 sheep in an hour.

If the apparatus were erected close to or over the race of the drafting yards, a greater number could be dosed, for it would only be necessary to raise the head of each sheep slightly, insert the nozzle, and deliver the dose.

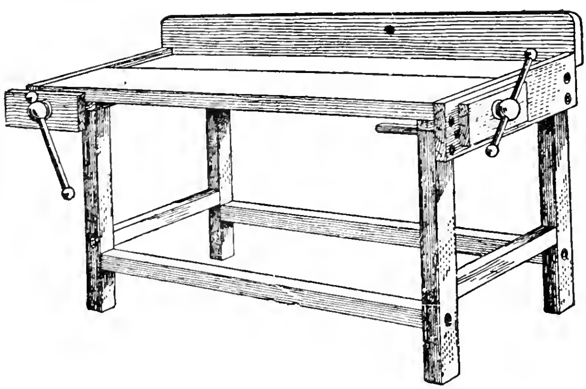
Whatever medicine was being used could easily be diluted so as to make either ½ or 1 ounce doses—the latter for preference. The contents of the keg should be frequently stirred to insure an even mixture, and thus avoid danger of overdosing.

An arsenic drench gives very favorable results in the treatment of worms in sheep, and may be conveniently prepared as follows:—Boil together slowly in a quart of water for half-an-hour 1 oz. of arsenic and 2 oz. of carbonate of soda. Then add sufficient water to bring the total quantity up to 3 gallons. Allow to stand, and later pour off the clear solution or strain it through a plug of cotton wool. The solution will then contain 1 grain of arsenic in each 1 oz. of solution.

The dose for a grown sheep is up to 2 oz.; the dose for a 9 months old lamb is up to 1½ oz.; the dose for a 6 months old lamb is up to 1 oz.

A WORKBENCH FOR THE AMATEUR.

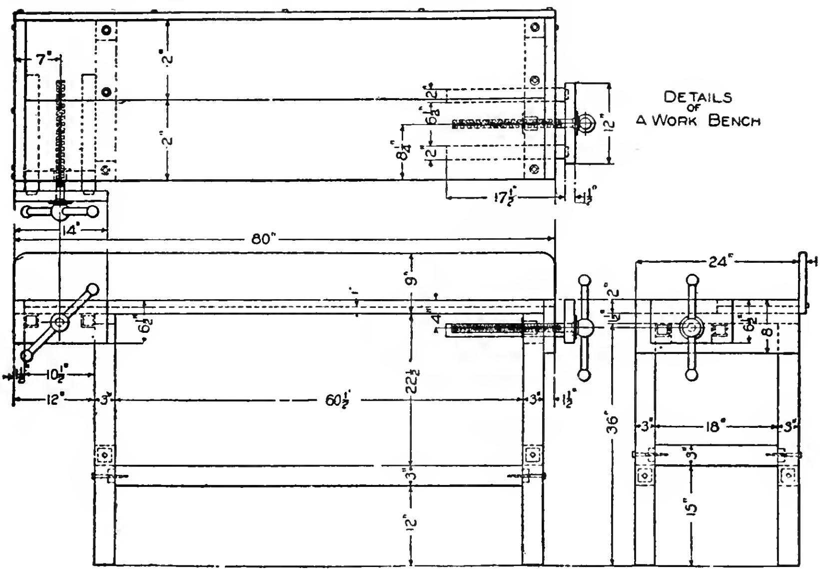
The accompanying detail drawing shows a design of a portable workbench suitable for the amateur woodworker. This bench can be made easily by any one who has a few sharp tools and a little spare time. If the stock is purchased from the mill ready planed and cut to length, much of the hard labour will be saved. The following pieces should be ordered:—



4 legs, 3 by 3 by 36.
2 side rails, 3 by 3 by 62½ inches.
2 end rails, 3 by 3 by 20 inches.
1 back-board, 1 by 9 by 80 inches.
1 top board, 2 by 12 by 77 inches.
1 top board, 1 by 12 by 77 inches.
2 crosspieces, 1½ by 3 by 24 inches.
1 piece for clamp, 1½ by 6½ by 12 inches.
1 piece for clamp, 1½ by 6½ by 14 inches.
4 guides, 2 by 2 by 18 inches.
1 screw block, 3 by 3 by 6 inches.
1 piece, 1½ by 4½ by 10½ inches.

Make the lower frame first. Cut tenons on the rails and mortise the posts, then fasten them securely together with $\frac{3}{8}$ by 5 in. lag screws, as shown. Also fasten the $1\frac{1}{2}$ in. by 3 in. by 24 in. pieces to the tops of the posts with screws. The heads should be counter-sunk or else holes bored in the front top board to the crosspieces by lag screws through from the under side. The screws can be put in from the top for the 1 in. thick top board.

Fasten the end pieces on with screws, counter-sinking the heads of the vice end. Cut the 2 in. square holes in the $1\frac{1}{2}$ in. by $4\frac{1}{2}$ in. by 10 in. pieces for the vice sides, and fit it in place for the vice sides. Also cut square holes in the one end piece for the end vice top boards to fit over them. Fasten slides, as shown. Now fit up the two clamps. Fasten the slides to the front pieces with screws. Counter-sink the heads of the screws, so they will not be in the way of the hands when the vice is used. The two clamp screws should be about $1\frac{1}{2}$ in. in



diameter. They can be purchased at a hardware store. A block should be fitted under the crosspiece to hold the nut for the end vice. After you have the slides fitted put them in place, and bore the holes for the clamp screws.

The back board can now be fastened to the back with screws, as shown in the top view. The bench is now complete, except for a couple of coats of oil, which should be applied to give it a finish and preserve the wood. The amateur workman as well as the pattern-maker will find this a very handy and serviceable bench for his work-shop.

As the amateur workman does not always know just what tools he will need, a list is given which will answer for a general class of work. This list can be added as the workman becomes more proficient in his

line and has need for other tools. Only the better grade of tools should be purchased, as they are the cheapest in the long run. If each tool is kept in a certain place, it can be easily found when wanted:—

One bench plane or joiner, 1 jack plane or smoother, 1 cross-cut saw (24 in.), 1 rip-saw (24 in.), 1 claw hammer, 1 set gimlets, 1 brace and set of bits, 2 screwdrivers (3 and 6 in.), 1 countersink, 1 compass saw, 1 set chisels, 1 wood scraper, 1 monkey wrench, 1 2-ft. rule, a marking gauge, 1 pair pliers, 1 nail set, 1 pair dividers, 1 pocket level, 1 6-in. try square, 1 oilstone, Nos. 1, 2 and 00 sandpaper.

—*Producers' Review* (Perth), 20th July, 1918.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Pomologist.

The Orchard.

Cultivation.

Orchard ploughing should now be finished, and the main work for the next few months will be an endeavour to keep the soil surface loose, friable, and well opened. The consolidation of the surfaces must be avoided, as a hard, compact surface means the loss of much soil moisture, by capillary attraction. So that after rains, heavy dews, the spray pump and other traffic, it will be as well to run the harrows over the surface of the soil, so as to keep the surface well broken and to maintain a good earth mulch. If the harrows are not sufficient to break the clods, a spiked or heavy roller should be drawn over it, and then harrowed. If the weather is at all dry it is advisable to plough only as much as may be harrowed in the same day. By immediately following up the ploughing with harrowing a minimum amount of moisture is lost by capillarity.

Green manure crops should now be ploughed under, and should they be very abundant in growth, a roller should be run over them and ploughed with a coulter attached. Any of these means will serve to get the crop underground, which is a desideratum.

In addition to the retention of soil moisture, cultivation of the orchards will suppress the weeds which rob the trees of food and moisture. The suppression of weeds is an important work in the spring and summer, and they should be rigorously hoed or cultivated out.

Spraying.

Spraying for all pests and diseases is, at this time of the year, an important work in the orchard. Bordeaux spraying for the black spot of apples and pears, for scab and shothole in peaches and apricots, for the leaf curl of the peach and rust of the plums and peaches, should now be completed.

Where there are indications that previous sprayings have not been thoroughly successful, a weak lime sulphur spray should be given.

Wherever they are present, nicotine sprays should be given to combat the peach aphis, and the pear and cherry slug. For the latter pest, arsenate of lead should not be used if the cherries are within a

month of ripening. Arsenate of lead is so tenacious, and thus it is likely to remain on the fruit until it is ripe, when it would be dangerous to the consumer. Thus, while this property of remaining on the fruit for a considerable time is of great value in the Codlin Moth spraying, it is quite of the opposite value when used for the pear and cherry slug. Either tobacco water or hellebore is useful for the eradication of this pest, as these substances do not remain long on the trees, and they are quite as effective as arsenate of lead.

Codlin moth spraying, too, will be in evidence this month. Owing to the early season, it is possible that the development of the moth will take place earlier. It is generally assumed that the appearance of the moth is coincident with the bursting of the flowers. This is not always so—the moths frequently come slightly later than the blooming period. Owing to the rapid expansion of the fruit, it is well to follow the first spraying with a second in a week or ten days' time. Arsenate of lead is still the spray for the Codlin moth, nothing having been found to supersede it.

Vegetable Garden.

A good tilth, and a well-pulverized soil, are the main soil necessities in the vegetable garden this month. Frequent cultivations will keep in the soil moisture, and will obviate the necessity for surface waterings. At the same time, it should be remembered that the vegetable garden requires more water than the flower garden, owing to the quick growth of the plants. Quickly-grown vegetables are more tender and more luscious than slowly-grown ones: thus a good water supply will need to be maintained. Weeds are great moisture-robbers, and they should be kept out of the vegetable garden at this time of the year.

Late plantings of tomatoes may now be carried out; all early-planted plants should be fed, staked, and the laterals pinched back. A little bone-dust or superphosphate may be given, but these are not equal to animal manures, if the latter are available. Chemical manures should only be given in limited quantities, 6 or 7 cwt. per acre would be a heavy dressing, and this works out at nearly 3 ozs. per square yard. Vegetable growers may easily try this for themselves, and it will soon be seen that 3 ozs. scattered over a square yard of surface will appear to be a very light dressing.

French beans, carrot, parsnip, celery, radish, peas, and turnip seeds may now be sown. Seeds of cucumber, melon, and pumpkin family may now be sown in the open ground. All seedlings may be transplanted on favorable days, and it will be well to sprinkle the tops as well as to water the roots.

Asparagus beds may be top-dressed with manure, and kept well weeded. Such weak growths that are not gathered for eating should be cut out of the beds.

Celery trenches will require attention at this time of the year; and to insure good, quick growth, frequent waterings will be necessary.

Flower Garden.

Flower gardens are troubled with many pests at this time of the year. Rose aphis is one of the most prevalent; frequent applications of tobacco water will keep this pest in check. The hot winds should

not be waited for so as to rid the garden of the pests, because a great deal of damage is done before the hot winds come. They should be sprayed in any case.

Rose mildew will also need combating. This may be done by dusting the bushes with sulphur while they are wet with the morning dew. The ground may also be sprinkled, as the fumes check the fungus.

Leaf-rolling or leaf-eating insects will need to be sprayed with arsenate of lead or Paris green.

The surface should be kept well hoed so as to conserve the moisture, especially after the frequent waterings that should be given.

Chrysanthemums may be planted in soil that has been dug over two or three times, and each time digging in manure. The soil must not be too rich, but must be well drained.

Bulbs that have lost their foliage may be lifted, but do not cut the foliage, as this means loss of sap and energy.

Asters, zinnias, salvias, balsams, amaranthus, celosias, &c., lobelia, bedding begonia, iresines, alternantheras, &c., may now be planted out for summer and autumn flowers.

REMINDERS FOR NOVEMBER.

LIVE STOCK.

Horses.—Continue to feed stable horses well; add a ration of greenstuff. Rug at night. Continue hay or straw, chaffed or whole, to grass-fed horses. Feed old and badly-conditioned horses liberally. If too fat, mares due to foal should be put on poorer pasture. Turn out workers due for a spell at grass. In view of sand trouble this year horses which have been paddocked all the winter should not be put to work until properly conditioned and any sand accumulation got rid of. A course of three or four bran mashes, after a twelve hours' fast, followed by 1 to $1\frac{1}{2}$ pints of linseed oil, is helpful. Repeat in two or three days, if necessary. Colts to be gelded should be operated on before hot weather sets in.

Cattle.—Except on rare occasions, rugs may now be used on cows at night only. Continue giving hay or straw, if possible, to counteract the effect of green grass. Be prepared for milk fever. Read article in *Year-Book of Agriculture*, 1905, page 314. Give calves a dry shed and a good grass run. Continue giving milk at blood heat to calves. Be careful to keep utensils clean, or diarrhœa will result. Do not give too much milk at a time for the same reason. Feed regularly with regard to quantity and time. Give a cup of limewater in the milk to each calf, also place crushed oats or lucerne hay in a trough so that they can eat at will.

Pigs.—Supply plenty of bedding in well-ventilated styes. Keep styes clean and dry, and feeding troughs clean and wholesome. Sows may now be turned into grass run. Sows suckling young should be well fed to enable them to produce plenty of milk. Give young pigs pollard and skim milk in separate trough as soon as they will take it, and keep them fattening from the start to get them off as early as possible. Give a tablespoonful of bone meal, or half that amount of mineral phosphate per 100 lbs. live weight in food daily. If pigs are lousy dress them with kerosene emulsion or sulphur and lard, rubbing well into crevices of skin, and disinfect styes. Pig breeding and feeding should be very profitable for a long time to come, and it should be safe to launch out now.

Sheep.—Prepare for dipping. Ascertain exact contents of bath before mixing. Powder or paste dips have the most lasting effect, particularly where lice have been bad. Hold sheep in the bath not less than half a minute; if badly

infested, longer. Submerge heads twice, but allow them to rise quickly—most deaths after dipping are due to gross carelessness in holding sheep under too long, the dip wash being taken in on to the lungs. Dip rams, full grown sheep first, while bath is full, lambs last. Yard sheep over night. Dip while empty, and avoid fouling the drainer. Commence early in the day, and allow sheep to dry before nightfall. Avoid travelling long distances to and from baths, and dipping sheep while overheated. Do not roughly throw sheep in. Avoid filthy baths; this increases a dead tip in hot areas.

It is unsafe, and against instructions, to use powder dips in increased strength. Sheep badly lice-infested should be dipped directly off shears, and again in six weeks' time.

When constructing new dips, remember moderate-sized ones are most economical, just as efficient, and can be more easily emptied as they become fouled, and if they are near water can be quickly filled.

Poultry.—Provide plenty of green food and shade. Watch for vermin; spray crevices of perches and houses with crude carbolic acid, 1 in 50. Keep water clean and cool, and out of the sun. One packet of Epsom salts should be given to thirty birds through the mash. Remove all male birds from the flock. Infertile eggs are preferable when pickling, or when placed in cool storage.

CULTIVATION.

Farm.—Plant main crop of potatoes. Cut hay and silage. Weed early potatoes. Sow maize and millets. Weed tobacco beds, and water, if dry.

Orchard.—Ploughing, harrowing, and cultivating to be continued. Weeds to be kept down. Secure, pinch, and spray grafts with water. Spray frequently for codlin moth, pear and cherry slug, and peach aphis. Plant out citrus trees.

Vegetable Garden.—Hoe and mulch surface. Suppress weeds. Water where dry and hoe afterwards. Disbud and pinch back tomato plants. Sow celery, French beans, peas, lettuce, cucumber, melon, &c., seeds.

Flower Garden.—Water and mulch. Cultivate and keep down weeds. Thin out weak wood from roses. Prune early all flowering shrubs that have finished flowering. Lift and store bulbs. Plant out chrysanthemums. Liquid-manure herbaceous perennials.

Vineyard.—Field grafts require careful attention in the way of removal of suckers and scion roots. (See articles in last and current issues.) Keep a sharp look out for Downy Mildew, and commence spraying on the appearance of the first symptoms of the fungus. Even if the fungus is not visible, spraying should be concluded by the beginning of November in the north, and a week later in the cooler districts. (See *Journal* for September, and also current issue.) Cultural work, such as scarifying and hoeing, should be actively pushed forward, so as to provide as good a "mulch" as possible during summer. Proceed with tying up, stopping and topping. Avoid excessive topping, summer pruning being usually more injurious than useful in warm, dry climates. Cincture Zante currant vines after flower caps have fallen. Apply second sulphuring just before blossoming, wherever Oidium was prevalent last year.

Cellar.—Same as last month.

JERUSALEM ARTICHOKES.

The attention of allotment holders, gardeners, and small cultivators generally is drawn by the Food Production Department in England (says *Farmer and Stockbreeder*) to the value of the artichoke, both for purposes of human food and for feeding to pigs.

Recent investigations by the Royal Society Food (War) Committee show that the artichoke, eaten in moderation, is an excellent human food,

and that its food value as measured in calories is superior to that of the potato. The composition of artichokes and of potatoes is as follows:—

—	Water.	Proteins.	Total Carbo-hydrates.	Calaries per lb.
Artichokes	79·5	2·6	16·7	365
Potatoes	75·5	1·8	14·7	310

The artichoke gives large crops. An average yield from field cultivation is about 10 to 12 tons, but in gardens and allotments it should be considerably higher. Estimates of yield obtained by the Royal Society Food (War) Committee give figures so high as 20 tons per acre on garden ground.

Other advantages possessed by the Jerusalen artichoke are that it is not subject to disease, and will grow in almost any soil and situation provided that there is an abundance of light and air. It succeeds best on a deep friable sandy loam.

For planting, medium-sized tubers should be chosen, or larger tubers may be cut into pieces, each with two or three eyes. The white tubered varieties are generally preferred to the pink, as they are of a better shape.

Planting should be done during spring. The tubers may be planted in shallow trenches or dibbled 4 to 5 inches deep in soil which has been previously well worked. The usual distances at which to plant are 3 feet between the rows, and 1 to 1½ feet between the sets. The planting should be closer in poor soils and wider in rich soils. Fourteen pounds of tubers will plant a rod of ground.

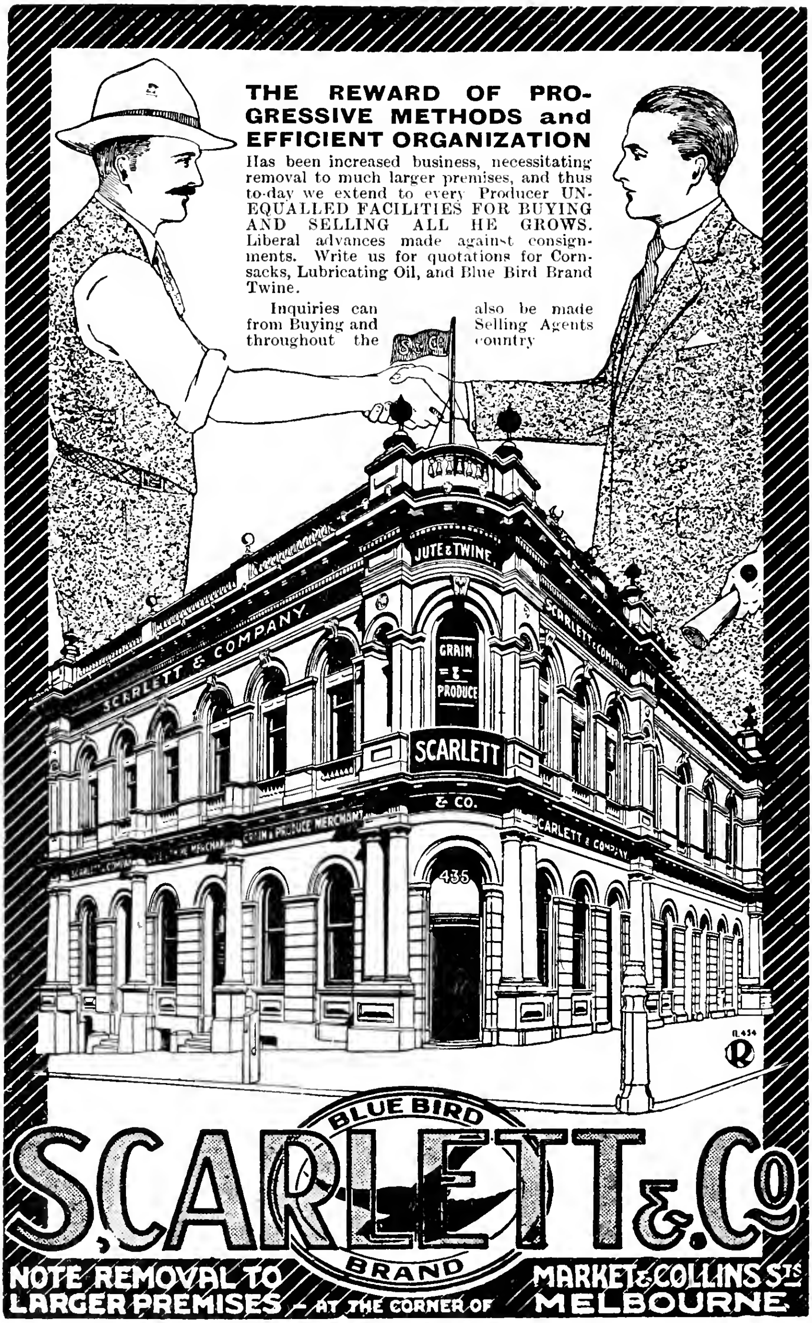
The only cultivation necessary is hoeing to keep down the weeds and the drawing of a little earth to the stem. The surface of the soil should be stirred during dry weather.

The tubers do not suffer from frosts, and may be left in the ground and lifted as required; or, to get over the difficulty of digging the tubers in frosty weather, they may be lifted and stored in sand in a cold shed or cellar, or they may be clamped like potatoes in the open. They should not be exposed freely to the air, for if so exposed the tubers become soft very quickly.

The fork should be used in lifting, and care should be taken to remove all the tubers, otherwise they will grow in the following year.

For use as pig food, artichokes when fed to small pigs should be cooked, but sows will take them raw.

Under field cultivation, and after the crop has been lifted, pigs turned into the field will clean the ground by picking up the small tubers left in digging, and a further advantage of thus turning in pigs will be the increased fertility of the ground.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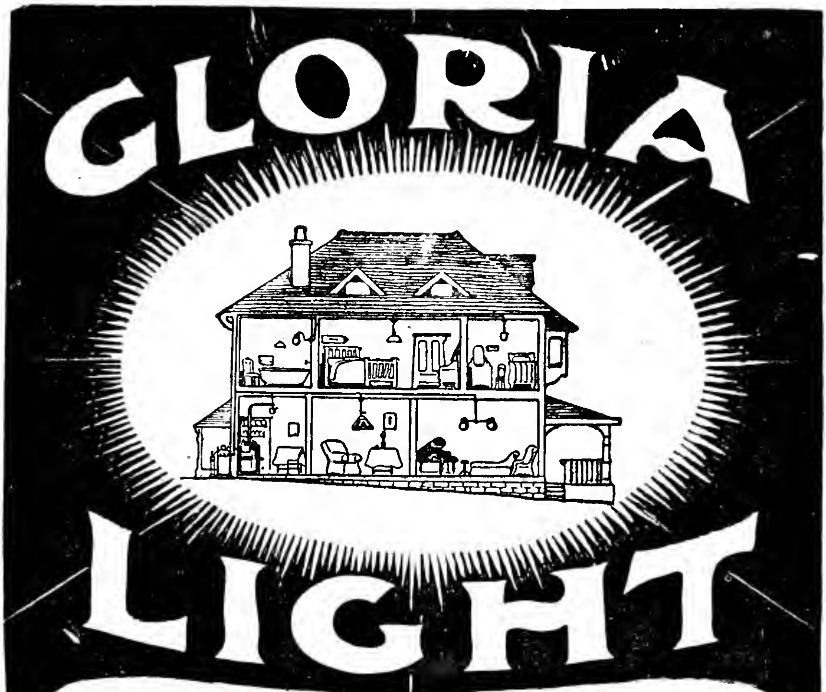

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FIELD DAY AT WERRIBEE RESEARCH FARM.

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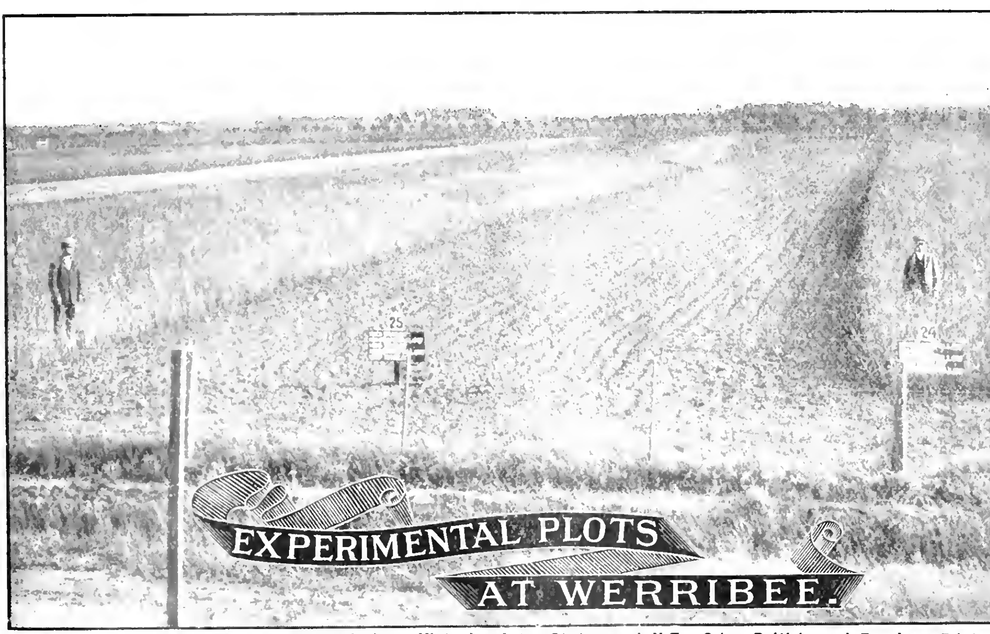

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THE JOURNAL

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THE JOURNAL

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Vol. XVI. Part 11. 11th November, 1918.

FARMERS' FIELD DAY AT WERRIBEE.

It was said many centuries since, "Skill is of greater avail to the woodman than strength," and the march of events in recent times has given the words a deeper meaning. Every year agriculture is demanding a higher efficiency. Land has increased in price, wages have risen, and, owing to the attraction of the city, labour is difficult to obtain. Consequently, if the farmer of to-day is to be successful, he must adopt more scientific methods than the farmer of the last generation. The large underlying questions concerning the growing of crops and the rearing of flocks and herds must be carefully considered, and efforts made not only to control diseases and insect pests, but also to meet the demands imposed by our uncertain climate. Some of the problems are, perhaps, elementary, and can be solved by individuals or by a few farmers working in conjunction, but many of them involve long and difficult experiments, and it was to deal with these that the Werribee Research Farm was established.

In 1913 an invitation was given to representative farmers and others to visit the farm, and every year since it has been the custom to hold a field day during Show week, so that the public may have an opportunity of seeing some of the experiments that are being carried on in the fertilization, cultivation, and rotation of crops, the cross-breeding of wheat, oats, and barley, &c.

This year the field day was held on the 27th September, and over 400—mostly farmers—accepted an invitation to visit the farm. The journey to Werribee was made by special train, and local residents met the visitors at the railway station, and conveyed them to the farm gate, where, in the unavoidable absence of Mr. Oman, Minister of Agriculture, they were welcomed by the Director of Agriculture (Dr. Cameron).

The visitors were shown over portion of the plots where experiments are being made in the raising of new wheats and barleys, in testing the value under Victorian conditions of cereals that have been found successful in other countries, and in the results from the use of different manures

in varying quantities. They were able to see at a glance the present results of the various rotation of crops, the permanent fertilizer plots, and the advantages of fallowing over continuous cropping. Very keen interest was shown in the lucerne fields, where the methods of cultivating and irrigating the crop formed the subject of a demonstration by Mr. Richardson, after which he was submitted to a fire of questions relating to every phase of lucerne culture.

During the walk round, the flocks of sheep with which cross-breeding experiments are being made were seen, and supplied a subject for a "talk" by the Director.

The permanent irrigated grass paddocks were visited, and here there was a practical demonstration in the methods of irrigation. On the way back, a stable manure spreader, capable of distributing at rates varying from 2 to 20 tons per acre, was seen in operation.

On the return to the farmstead, some of the guests took the opportunity of having a look round the cow sheds and other outbuildings, while

Visitors listening to a lecture on the cultivation of lucerne.

a few made a visit of inspection to the cottage which has been erected for the accommodation of returned soldiers who are being trained in farm work.

When afternoon tea had been partaken of, Mr. C. E. Merrett, President of the Royal Agricultural Society, in moving a vote of thanks to the Government for its invitation to the farm, said:—"I think we would be wanting in gratitude if we did not express our grateful thanks to the Government and to the Department of Agriculture for having to-day given us facilities to see what has been done and is being done on this experimental farm. I do want you farmers, when you go back to your farms, to spread the doctrine of what the Department is doing, in order to advance agriculture. It must be obvious to everybody that it is of the utmost necessity that there should be a greater production per acre, and a greater return from each dairy cow, if we are going to make the most of this country. Therefore, we must take advantage of the opportunities that the latest methods of agriculture and herd-testing afford.

There is one thing I would ask of you, and it is that, on your return, you should tell what is being done on this farm, and influence your fellow agriculturists and fellow dairymen to come down here and see for themselves. I want you to pass a most hearty vote of thanks to your Government for what they have done in the interests of agriculture, and also to say how glad we are to see the Treasurer present to-day." (Applause.)

The Hon. W. M. McPherson, M.L.A., in acknowledging the vote of thanks, said:—" I can assure you that it is a very great pleasure indeed for me to be here to-day. I have never before had an opportunity of visiting this farm, and I have to acknowledge that my visit has been a great eye-opener to me. I am spoken of as belonging to an economy Government, and that is so. I want you to realize, however, that the idea of the Government is not to cut down expenditure, but to see that every shilling and every pound that we spend returns its full value to the citizens of this State. (Hear, hear.) There is no doubt that there are Government economies that can be made that will not impair the efficiency of the State. I have been told by Mr. Richardson to-day that the value of the agricultural products of Victoria is something like £40,000,000, and that the net amount of expenditure on our Agricultural Department is only about £40,000. I venture to say that there are some other Departments that could economize somewhat, and that some of the money expended by them could be better spent on such work as I have seen to-day. There is no doubt that the past Government did well in sending Mr. Richardson to America. I am one of those who believe that our younger men cannot see or learn too much of what is being done by other countries, and in my own business I have sent men abroad for information. It is right for our State servants to go abroad and see what other people are doing, and bring information back, and let you gentlemen apply it. I say that all that we spend in this way is very well spent. I am not an expert in agriculture, but I do claim to be able to recognise a well-conducted, well-equipped, and well-designed place when I see it, and I say emphatically that I have seen such a place to-day. (Cheers.) I congratulate those who are in charge of this farm. I thank Mr. Merrett for his remarks, and I will go to the Government and do what I can to see that an experimental farm such as this receives every encouragement. When I took office, I ordered that balance-sheets should be prepared of State activities, and, when the balance-sheets of this and other experimental farms were presented to me, it was pointed out that there were certain losses on them, and I said that I would not have the matter represented to Parliament in that way. The cost of these educational institutions should not be regarded as a loss to the State. The purely commercial side should not be the only one to be considered. Every farmer must make his living on his farm, and the commercial side of farming should be inculcated in our young farmers. We want that, plus a knowledge of scientific farming, and this farm is here to help to give the farmers that knowledge. I hope the results of the farm will be beneficial to the farmers—I am sure it will. If fate should decree that I occupy my office for another year—one cannot be at all certain of such a thing—I hope to come down here again and look over the place, and spend more time in doing so."

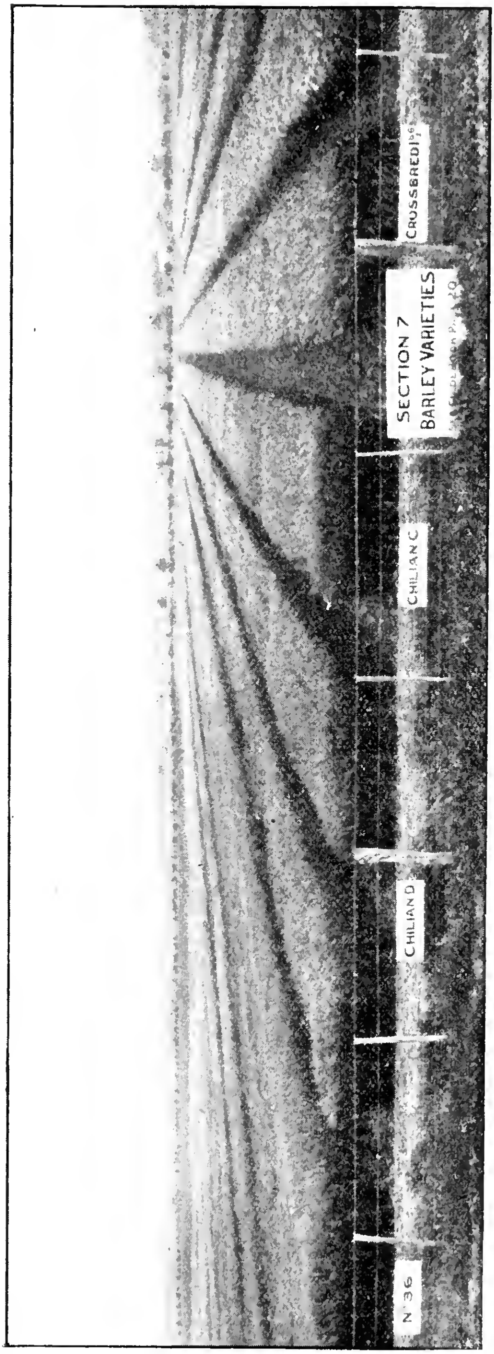
After apologizing for the absence of the Minister of Agriculture, Mr. A. R. Robertson, M.L.A. (Honorary Minister), said:—" I would like to

take this opportunity, as member for the district, of heartily welcoming the visitors from this and other States, and also many members of Parliament whom I see here, representing different sides of the House. Their presence shows a desire on their part to take an active interest in work of this kind. In carrying out the experiments on this Research Farm, I feel that we are harnessing science and practical utility together. It is very gratifying to me, as I am sure it is to you, to know that the net cost of the farm amounts to less than £2,000 a year. It is gratifying to the Department, and to everybody, to know that the people of the State take such an interest in coming here, not only to-day, but at other times, snatching time from their other business, in order to see the experimental work that is being undertaken. I wish to congratulate the Department, Dr. Cameron, and Mr. Richardson, on the splendid results attained on this farm, and I hope that all members of Parliament who have been here to-day will do their best to assist valuable work of this kind. We feel we can do but little unless we get the support of the people in the country to encourage us to go on with the work of improving the prospects of our primary industries." (Cheers.)

A talk on sheep by Dr. Cameron, Director of Agriculture.

The Hon. J. Cameron, M.L.A., in expressing his appreciation of the work of Dr. Cameron and other members of the Department, said he took a personal interest in the Werribee Research Farm because he had recommended that the Government should use a piece of the Werribee Estate for experimental work. "In making the recommendation to my colleagues," remarked Mr. Cameron, "I said that the rainfall approximated to that of the Goulburn Valley, and that the soil was similar, so that the conditions of both districts were identical." He asked that a hearty vote of thanks be accorded to Dr. Cameron and his staff.

The vote of thanks was acknowledged by the Director of Agriculture, who said:—"On behalf of the staff of the Department of Agriculture, and particularly of the officers connected with this farm, I want to offer you my sincere thanks for your remarks. It is indeed very gratifying to us, who, I will confess, have laboured very hard in the establishment of this farm, to have such a fine evidence of the good will and appreciation of the farmers of the State as that we have had to-day. I mention the

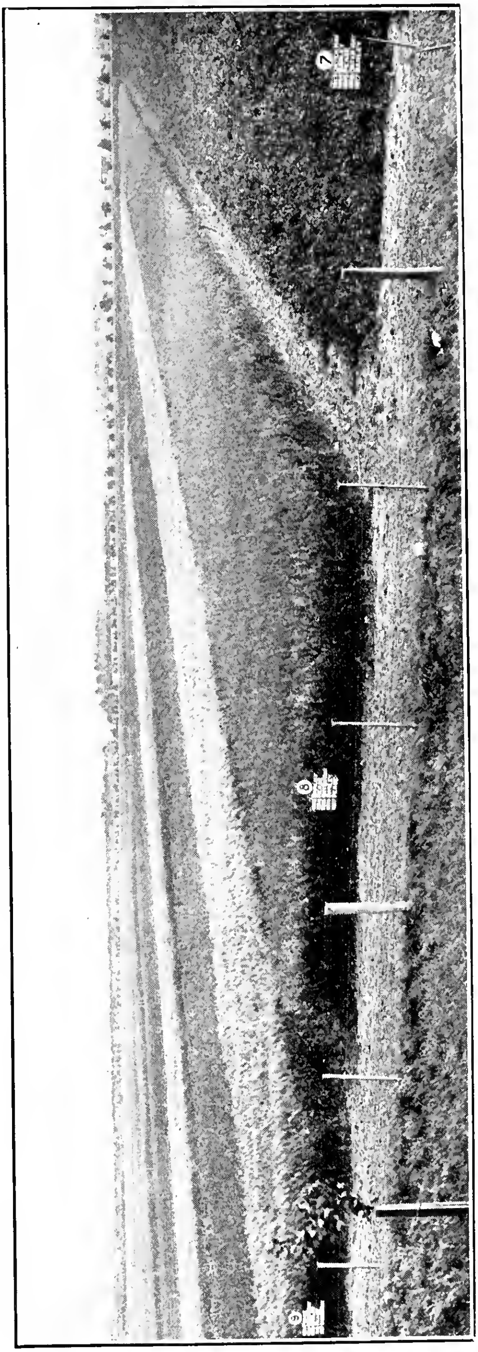


A view of the Barley Plots.

farmers of the State first, because I think they are the most important. I have also listened with very great gratification to the remarks of the members of Parliament who have spoken, and particularly to those of the Honorable the Treasurer. You can readily understand why I was so gratified to hear the latter. The officers of the Department have very great confidence indeed in the beneficial influence that this farm will exercise on the agricultural interests of the State, and, incidentally, therefore, upon the wealth of the State. Their one effort is in that direction. I am also appreciative, and I am quite sure that this will be indorsed by all the officers of the Department, of the remarks made by Mr. McPherson as to the exercise of true economy. I do not believe in starving any work that is likely to prove beneficial, and I am glad to learn that the views of the members of Parliament present to-day concur with mine. When we had the first farmers' field day—five years ago—I issued a challenge to the farmers of the State then present. I asked them to point out anything of a non-practical kind that was being done—any useless expenditure. I am gratified to be able to say that, from that time to this, my challenge has not

been accepted, and I do not think any work has been done on the farm that has not been in the interests of the agricultural community. I thank you for your attendance here, for the interest you have taken, and for the appreciative remarks I have heard.

Mr. Menzies, M.L.A., having been called upon to address the visitors, said:—"I was very pleased indeed to hear the Honorable the Treasurer express the views he has respecting economy, which is a word in great vogue in Victoria to-day, and I gather, from what he has said, that, after all, what is required is to see that you should receive some return for the money that is being expended. Now, I do not know the feelings of the farmers generally, but I can just give you the impression that has been formed in my mind. We have only been able to cover very little of what we should like to do in connexion with the work of these farms. I want to see this Government, or any other, realizing, as we do, the basis upon which we have found our national wealth and our national greatness. Unless we get that foundation laid broad and deep, God help the secondary interests. I believe I am expressing the views of other members of Par-



Experiments in the Rotation of Crops.

liament, as well as my own, when I say that what we want more than anything else is that we should have a re-adjustment of our expenditure. What we have looked upon to-day, which is a direct charge upon the State, means an actual loss of only £1,700. What we want to recognise is this—that there should be a re-adjustment of our interests and the relative importance of Departments, and I venture to say that, if this were done, we should not have a niggardly or a grudging attitude towards agriculture, and, instead of spending a paltry £40,000 a year, we might be spending ten times that amount with advantage. I am a member of the Agricultural Council, and we acknowledge our indebtedness to Mr. Richardson for the information he has given us, and the fresh outlook he has put before us as a result of his recent visit to America. I should like to see all the farmers of the State come here and see for themselves the result of the many experiments that are being carried on in their interests."

The following extract is taken from a report on Farmers' Experiment Plots, published in the *Agricultural Gazette of New South Wales* for October, 1918:—

TRIALS WITH OATS.

Algerian is widely known as one of the best all-round varieties. Complaints have been made against this variety in the far Western areas that, where it has been hurried to maturity by hot weather, it develops a bitterness and becomes unpalatable to stock. This same feature is noticeable in Tartarian oats, and in such cases an early oat such as Sunrise should be grown. Where grown, Algerian produced the highest yields of grain, but this was probably due to the late season experienced. Sunrise exceeded Algerian in hay yield.

Guyra, an Algerian-White Ligowo crossbred, is a most promising variety. It seeds well, producing a nice plump grain that may prove suitable to the oatmeal manufacturers, who at present import the plumper Victoria-grown oat, usually Algerian. Guyra has not the length of straw of Algerian, but makes good hay.

Lachlan, another Algerian-White Ligowo cross, is intermediate in length of straw between Guyra and Algerian. Is earlier than Guyra. The same notes as for Guyra apply to this variety, apart from the differences mentioned.

Sunrise.—A selection from Algerian; is the earliest oat we have. At Nymagee it shed its grain very freely when ripening. Before harvesting a rainstorm occurred, and the ground was almost covered with the grain which had been shed. This feature was not pronounced when grown elsewhere. It is a good hay oat with white seed, and is assured of a good future.

Brown Calcutta is too weak in the straw to receive much consideration from the farming community. At Orange it lodged extensively, being the only variety to lodge.

Potato oat produces plump white grain, but owing to its readiness to take flying smut is not so well liked as Algerian.

APPLE CULTURE IN VICTORIA.

(Continued from page 462.)

By J. Farrell, Orchard Supervisor.

Gnarl of the Gravenstein Wood.

Before passing on to the study of the pests and diseases of apple trees and their fruit, it might be well to consider the matter of the undesirable irregularity which appears in the wood of most Gravenstein trees. This objectionable development is commonly known as the "gnarl," or twisting of the wood. The Gravenstein has long been regarded as one of the best and most profitable of apple trees under cultivation in Victoria. This should be a sufficient incentive for all those interested in its cultivation to endeavour to find a means by which the twisting habit may be prevented, or, at least, minimized.

The gnarled wood is produced by the premature hardening of a lengthy section or sections of the cambium, thus preventing sap activity in these parts. Depressions, which run with the length of the affected stem or branch, are thus formed. The free passage of the sap promotes strong growth in the healthy portions, causing elongated protuberances to appear. These depressions, interspersed with the elevations running longitudinally in the surface of the wood, give it a corrugated appearance. This peculiar habit of growth, although generally regarded as being exclusively confined to the Gravenstein, is occasionally noticed in trees of the Missouri Pippin variety. Gnarl in the latter usually supervenes on variety degeneration and general debility, whereas robust specimens of the former are most liable to its attack.

A high percentage of Gravenstein trees become affected, and the twisting of the wood usually commences early in the life of the trees. In many instances, after a few years' growth, the stem is so extensively corrugated, and the sap flow so seriously interrupted, that the whole superstructure collapses for want of plant nutriment. When the main arms or sub-leaders only are affected, the stem being healthy, the case is not so serious, because corrugations of the virulent form can bring about the destruction of individual branches only. Scientific pruning will often obviate the production of those undesirable sections or replace them by others of more befitting character.

Plate 178, Figs. 1 and 2 show specimens of three-year-old Gravenstein wood, and the cross sections cut from the ends of each depict the corrugations even more clearly than do the long sections. When trees suffer from ordinary hardening or tightness of the bark, they are said to be bark-bound. This impediment is often relieved by making longitudinal incisions in the bark with a grafting knife or other suitable instrument, thus enabling the sap to become more active. Experiments have proved, however, that this treatment of the gnarled wood, instead of bringing about an improvement, rather exaggerates the evil. The specimen illustrated in Fig. 2 (b) shows that the bark did not respond to the incision in the depression, while it opened freely on the swelled parts (a) and (c). This incision was made when the wood was two years old, and the photograph was taken the following year.

Annually the corrugations or sectoral inequalities in the wood of affected trees become more pronounced in consequence of the high and increasing ratio of growth in the raised parts as compared with the depression. When the stems become badly affected, they are contorted into many shapes, but the most serious condition exists when the wood becomes flattened. While in this state the trees are liable to break down with the weight of their fruit, or they may have their stems broken by the wind, or the tree may be blown down bodily.

The illustrations in Plate 179 will enable the reader to better understand how this impediment in the Gravenstein wood develops. These cross-sections were taken from the stem of a badly affected

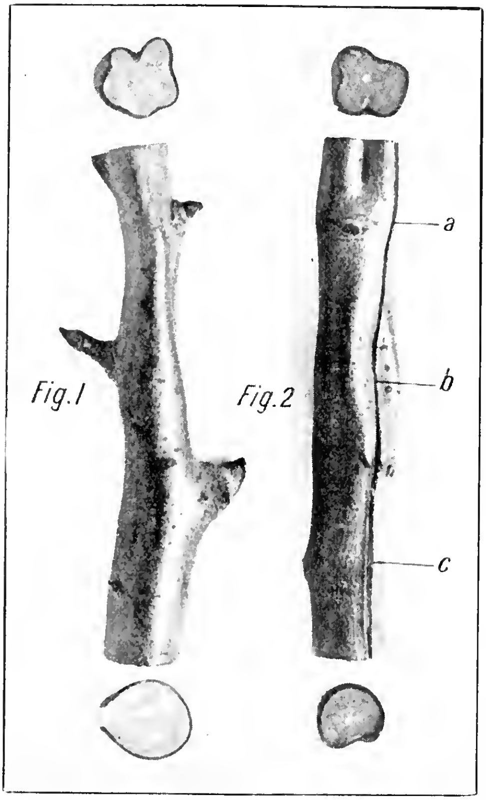


Plate 178.—Sections of affected wood from a Gravenstein tree, three years old.

fourteen-year-old tree. They were 10 inches apart, and the corrugations irregular, as the illustrations show. When the stems and branches make normal growth, the annual rings of wood, when viewed in cross sections, describe almost perfect circles. The wood of every sector of each annual ring is of uniform development and equi-distant on the medullary lines from the pith. Now compare the cross-sections in the illustration with the formation described. The inner circle in Fig. 1

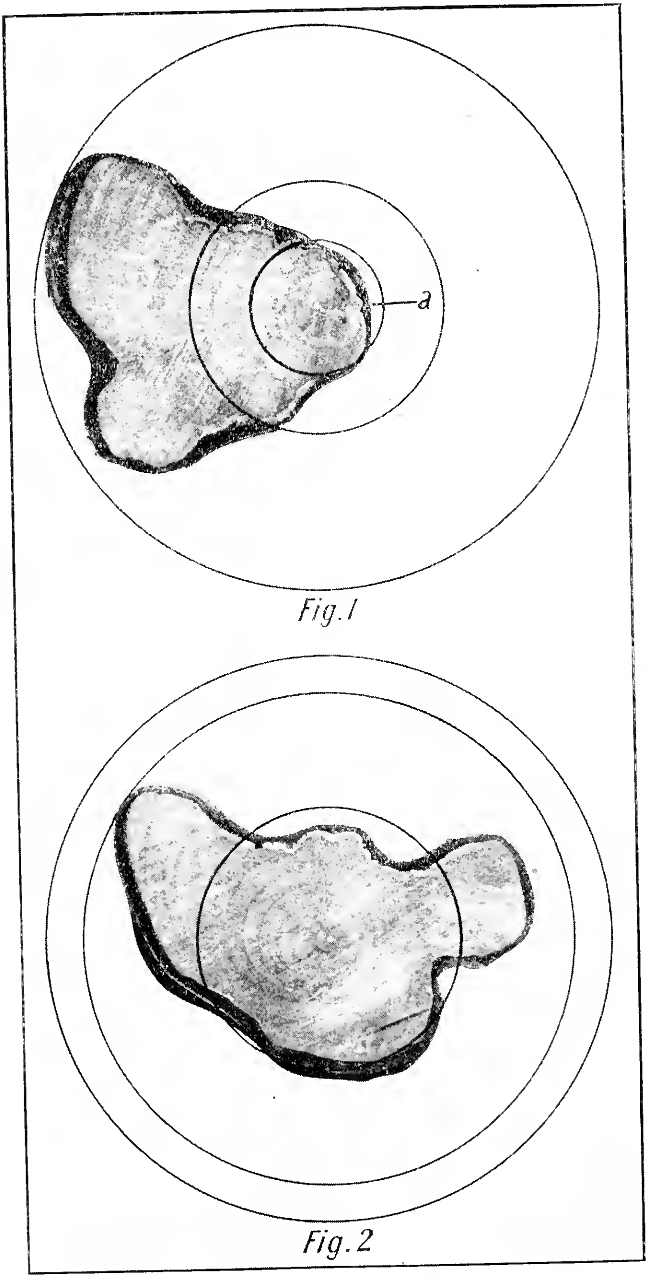


Plate 179.—Cross-sections from a badly-affected Gravenstein tree, fourteen years old.

circumscribes the wood formed during the fifth year of the tree's growth, and (a) denotes the point at which the gnarl commenced when the tree was three years old. The next circle shows the extent to which development would have taken place under normal growth, and defines the course of the gnarling during that time. The outer circle only shows approximately the diameter of the stem, because the full action of the

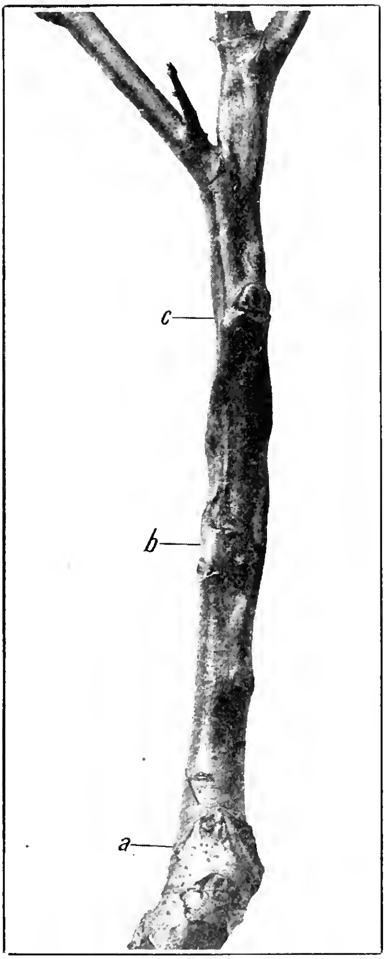


Plate 180.—A limb from a badly-affected two-year old Gravenstein tree.

sap in any particular sector, while blocked in others, causes the formation of thicker layers of wood in that direction. Hence the diameter of this circle is proportionately greater than it would be had natural development taken place. The inner circle in Fig. 2 shows the diameter reached by the wood rings of this section at the end of the eighth year, and the indentations denote that the gnarling commenced

after the sixth year. The distance between the next circle and the outer one represents the difference between the radius of the circle circumscribing this specimen and that enclosing Fig. 1.

In consequence of the sap ceasing to flow in the cambium of the depressions, the bark of these portions, although becoming partly devitalized from the time of infection, usually retains its natural colour, but becomes coriaceous, and adheres firmly to the wood. Further experiment and observation will probably reveal the cause of the discontinuance of sap circulation in the affected cambium. With most diseases, a diagnosis is necessary before a remedy can be obtained. In the case of the gnarl, however, the fairly satisfactory remedial or preventive measures known at present to exist can generally be adopted.

When trees become affected while young like that illustrated in Plate 180, no time should be lost in removing and replacing them with others propagated in such a manner as to render them less liable to be attacked. In this specimen, photographed at two years old, (a) shows the point where the bud was inserted in the Northern Spy stock, and the portion of stem between (b) and (c) commenced to gnarl the first year after the yearling whip-growth was planted. Owing to the violent twisting in the wood, this tree would probably have been broken down by the wind before reaching the age of six years.

Experiments and observation have shown that by careful bud and scion selection, and by the employment of suitable stocks when propagating trees, predisposition to unfruitfulness and ordinary variety degeneration may to a great extent be corrected. Much success has been achieved during recent years by working on these lines.

A considerably higher percentage of Gravenstein trees develop this impediment when worked on Northern Spy in the ordinary way than when grown on their own roots or on seedlings. Nevertheless, owing to their susceptibility to woolly aphis, these stocks cannot be recommended for general use.

A more practical method of coping with the gnarl is to plant some strong growing variety, such as Emperor Alexander, on Spy stocks, and hard pruning for the first two or three years will insure the production of trees of broad and substantial framework. Then the last yearling growths may be budded over or top-grafted with Gravenstein to complete the building of the trees. A tree constructed in this manner, the stem, main, and secondary arms constituting the intermediate stock being immune from gnarl, offers a solid foundation to the Gravenstein superstructure, of which only individual branches could suffer by subsequent attack. Then, to further reduce the possibility of perpetuating the twisting habit of the wood, only buds and scions of trees free from gnarl should be employed.

Insect Pests and Fungus Diseases.

There is no phase in the general routine work of the orchardist's business in which more knowledge of details is required and thoroughness of individual attention practised than in the case of sprays and spraying. These remarks especially refer to apple-growing, on account of the many insect pests and fungus diseases which infest apple trees

and their fruit, because of the comparatively extensive area under cultivation, the various classes of soils, and climatic conditions generally involved. Some seasons are more favorable to the development of pests and diseases than others, and though the trees be assisted by scientific pruning and good cultural treatment until they arrive at the fruit-bearing age, profitable crops will not be harvested unless careful spraying be practised. It is often necessary to spray trees for woolly aphis, black spot, &c., even before the fruit-bearing stage is reached. The orchardists now realize the advantages of spraying thoroughly, and, notwithstanding the present high prices of spray materials, the suppression of pests and diseases is being satisfactorily carried out.

The power-pump being a labour-saving appliance, as compared with the one originally operated by hand, has proved a great boon to the orchardists; it is also more efficient and economical than the old device. Its greater efficiency consists in being capable of driving a powerful agitator, which maintains the mixture in proper solution, and by producing a fine mist or driving spray as occasion requires. Working under these conditions, the operator is enabled to apply the spray where required, and to use it economically. Power-pumps are now exclusively employed in the larger orchards, while many are also used in the smaller ones.

Insect Pests and their Treatment.

To cope successfully with orchard pests by the application of suitable spray mixtures at the right time and in an efficient manner, it is essential that the orchardist should possess a fairly good knowledge of the life history of the particular insects against which he has to contend. A study of entomology sufficiently comprehensive to enable him to thoroughly understand the different stages, and to know the times of changes in the life cycles of these insects, would still better equip him for the work of destroying them.

The officers of the Orchard Supervision Branch of the Department of Agriculture, realizing the importance of maintaining a high standard of efficiency in the different fruit-growing centres, have for many years, by means of lectures, demonstrations, and by visiting the orchards, &c., done all that is possible under the circumstances to promote the study of insect pests and their treatment. During the early days of orchard-pest suppression, the life history and habits of these insects not being as well known as now to the fruit-growers, they were advised to regard the pests as belonging to two groups, and to treat them accordingly. One group comprises the jaw-feeders, such as codlin moth, painted apple moth, &c., which were then destroyed by poisoning their food with paris green, for which arsenate of lead has been substituted. The other group consists of insects which live by suction, such as woolly aphis, red spider, &c., and were destroyed by bringing some caustic material, such as kerosene emulsion or tobacco wash, into contact with their bodies. This simple method of grouping the insects has proved satisfactory, because it contains the two basic principles which underlie the practice of spraying. These principles will always hold good in the case of insects working in the open, but they cannot be made to apply to such pests as the root borer underground or the fruit fly in the larval stage operating in the fruit.

CODLIN OR CODLING MOTH (*Cydia* (*Carpocapsa*) *pomonella*).

This pest was responsible for the destruction of such large quantities of apples during the years just prior to 1904 that it was feared apple-growing on commercial lines would have to be abandoned. Paris green was the spray used then, and, from an average crop, 35 to 50 per cent. of sound fruit was regarded as a fairly good return. With the introduction of arsenite of lead, about 1906, the quantity of sound fruit increased to fully 80 per cent. The use of arsenate of lead commenced in 1907, and the results obtained since then by the judicious use of this mixture have been so highly satisfactory that, in many instances, 98 per cent. of sound fruit has been harvested. Owing to the efficiency of arsenate of lead, the bandages formerly employed to act as traps in which to catch the grubs have been dispensed with, and the work of destroying natural harbors, such as loose bark and crevices in the trees, has ceased to be regarded as important in orchards that are kept thoroughly sprayed.

Several brands of arsenate of lead were on the market a few years ago, and, although analyses showed that they contained almost equal quantities of poisonous matter, some were proved to be more effectual as insect destroyers than others, consequently only a few of the best brands are now available. Provided the powdery residue or deposit of two sprays remaining on the foliage and fruit after the air has dried off the moisture be equally poisonous, the more adherent and cohesive one will be the more efficacious as an insect destroyer. These properties enable the powder, while maintaining the union of its own particles, to stick to the tree, and, having once dried, it is not afterwards seriously affected by rain. The powder thus retains its position on the tree for a considerable time, and expands with the growth of the leaves or fruit, as the case may be. The superiority of arsenate of lead over arsenite is due to the deposit of the former being a powder as described, while that of the latter is a thin film, which cracks and drops off as the fruit expands, and is more easily washed away by rain.

In order to determine the times to apply the first and subsequent sprays for the codlin moth, it is necessary to understand its life history, and to know its methods of attacking the fruit. It hibernates in the larval stage under loose bark or in other crevices in the tree, and occasionally in the soil near the butt of the tree. A certain number pupate in early spring, and emerge from the chrysalides as moths about the time the petals of the flowers are falling. The females commence to lay their eggs a few days later on the young fruit clusters, often before their calyxes close, and on the leaves near them. We know that a certain, sometimes a high, percentage of grubs enter the fruit through the calyx end, therefore it is reasonable and logical to conclude that the best time to apply the first spray is after the petals of the flowers have fallen, but before the calyxes close. When the first spray is applied at this time, the residue of the mixture adheres to the nectar remaining in the nectary, and, when the sepals close up, the poisonous matter practically lines the cavity of the calyx. Not alone are the first-hatched grubs prevented in this way from entering the fruit, but, as arsenic retains its effectiveness for a considerable time, subsequent attacks would also be repulsed, with considerable loss to this enemy of the fruit-grower.

The illustrations in Plate 181 depict three stages of the young fruit of the Duchess of Oldenburg variety after the fall of the petals. Fig. 1

shows the condition of the flower when the first spray should be given. In Fig. 2, the sepals have partly closed, and it would be practically impossible to spray, the calyxes of fruit having arrived at the condition of Fig. 3.

The calyxes of some varieties, like the Rymer, illustrated in Plate 182, Fig. 1 (a), remain partly open during the development of the fruit, and, in spraying these, a certain amount of the poisonous matter is admitted. But a deep and tightly closed calyx, like that of the Moss' Incomparable, (b), excludes the spray. Fig. 2, (a) and (b), shows the Moss' Incomparable cut in halves, and the arrows point to the arsenical deposit in the calyx. The colouring has been intensified so that it might show clearly in the illustration.

Arsenate of lead at the rate of 4 lbs. to 100 gallons water makes an effective spray. When a nozzle of the Cyclone type is employed, and

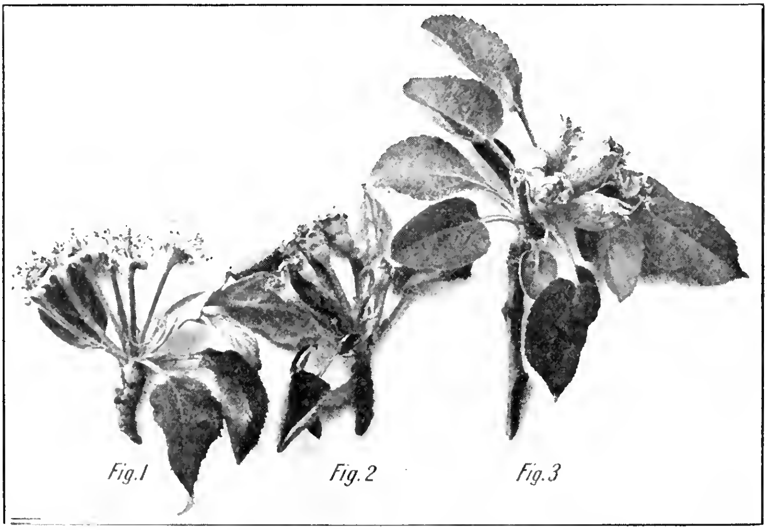


Plate 181.—Three stages of the young fruit of the Duchess de Oldenbury variety.

fairly high pressure attained, the desirable misty spray is produced. The tree may be sprayed all over, but the nozzle should be directed particularly towards the fruit clusters. Spraying should continue until all the fruit has been covered with spray, and discontinued before dripping commences. When dripping occurs, most of the heavier matter which forms the residual poisonous deposit is lost. The second spray may be applied about three weeks later, and further applications as occasion requires. Careful observation will reveal the extent of egg-laying, and this should be made the chief factor in determining the time for the later sprays. The eggs are laid on the fruit and on the leaves around it, and the young grubs hatch out in from seven to ten days, according to the weather conditions. The egg is about the size of a small pin's head, flat, and of a silvery-white colour. It becomes somewhat conical as the young grub develops, but assumes a rather convex shape when the larva escapes from under the shell. The illustration, Fig. 1, (c),

is a photograph of a fertile egg on an apple, and is magnified to approximately thirty times its natural size. Extra vigilance is needed between the middle of January and the middle of February, because experience has taught that during that time large numbers of eggs are laid on the fruit, and a spray promptly applied prevents a violent attack by the grubs. This spray, besides saving the fruit, destroys many grubs that would otherwise hibernate to the following spring.

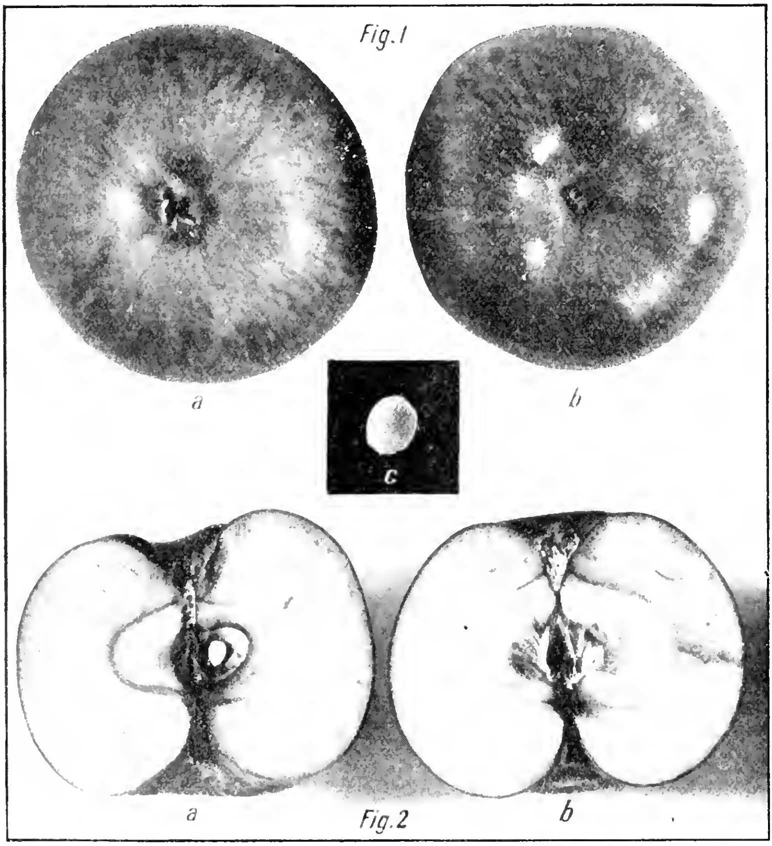


Plate 182.—Fig. 1. Samples of Rymer and Moss's Incomparable.
Fig. 2. Halves of a Moss's Incomparable, showing arsenical deposit in the calyx.

A very minute quantity of poison is sufficient to destroy the young grub, which, on hatching out, frequently crawls to some sheltered part, and thence enters the fruit. The calyx is often selected as an ingress to the apple, and when the first spray is given as recommended, entry by this channel is prevented. Then, when judiciously applied, the deposits from the second and subsequent sprays cover the clean surface areas created by the expanding fruit, and protect it from being attacked by the later broods.

Light-Brown Apple Moth (*Cacoecia postvittana*).

The habits of this insect are somewhat similar to those of the codlin moth, therefore, by spraying as recommended for the latter, the former will also be effectually dealt with.

Painted Apple Moth (*Teia anartoides*).

This pretty little moth, the hairy caterpillars of which often do considerable harm to the foliage of apple trees, is well known to the orchardists. In consequence of the gregarious habit of these insects, individual trees are usually selected for attack, and the epidermis of the leaves is quickly eaten off, the skeletons being left intact. The insects rarely do much damage during the time of spraying for the codlin moth, but later in the season, when this ceases, the pest becomes more virulent. An application of the arsenate of lead at the rate of 1 lb. to 30 gallons of water when the young caterpillars are noticed will be found efficacious.

Pinara Moth of the Apple (*Pinara nana*).

The larvæ of these insects, which are not very numerous, feed on the leaves and buds at night. During the day the caterpillars are difficult to detect, owing to the colouring of their bodies being almost similar to that of the bark to which they attach themselves. Instead of eating only the epidermis like the painted apple moth, the pinara grubs devour the whole leaf, but only minor damage is done if the codlin moth sprays be regularly applied.

Apple Root Borer (*Leptops hopei*).

This insect, which is indigenous to Australia, is one of the most easily recognised, formidable, and destructive of the pests against which the fruit-growers have to contend. In badly infested areas, large numbers of the beetles emerge from the ground during early spring, and the females commence to lay their eggs in the leaves. As the young grubs hatch out they fall to the ground, and find their way to the roots, into which they tunnel, thus injuring the bark, and interrupting the natural flow of the sap. The branches of trees affected in this way commence to die from the top downwards, and this condition is generally known as the "die-back." The presence of the borer is further evidenced by the production of sucker growths near the base of the leaders. When a diseased branch system is cut hard back with a view to re-establishing and invigorating it, healthy growth is usually obtained, but the tips of the young leaders commence to die back again after about five years of healthy growth. Trees in this condition are also unsuitable as stocks; the grafts may do well for a time, but they also become affected after a few years. Little success has attended attempts made to destroy the grubs on the roots by the use of bi-sulphide of carbon. However, as the beetles eat the leaves, good results have been obtained by spraying the trees with arsenate of lead, and great numbers have been collected from the trees and caught by means of traps.

(*To be continued.*)

AMERICAN AGRICULTURE.

Address Delivered at Horsham by Mr. A. E. V. Richardson, Agricultural Superintendent.

(From the *Horsham Times.*)

A social smoke night was held on Friday evening at the Masonic Hall under the auspices of the Horsham Agricultural Society, when nearly 200 representative men of the Wimmera assembled. Mr. P. Learmonth, president of the society, occupied the chair. Amongst the guests were Mr. F. G. Clarke, M.L.C., Minister for Lands; Mr. D. S. Oman, M.L.A., Minister for Agriculture; Mr. Arthur S. Rodgers, M.H.R.; Mr. James Menzies, M.L.A.; Mr. McIver, Chairman of the Closer Settlement Board; Mr. J. Weldon Power, Victorian Wheat Pool; Mr. A. E. V. Richardson, Superintendent of Agriculture; and Mr. J. F. Guthrie, Geelong manager for Dalgety and Co. Ltd.

After the loyal toasts had been honoured, the president said they had gathered that evening to listen to some very important statements by the Ministers for Lands and Agriculture, both of whom had visited the Horsham show with the view of obtaining first-hand knowledge of conditions prevailing in the Wimmera. They would also be favoured by the Victorian Superintendent of Agriculture with his impressions of the United States of America and the lessons suitable to Australian agriculture which he had gained on his travels. He would not trench upon Mr. Richardson's time by any further words of introduction of one who was so well and favorably known amongst farmers.

Mr. Richardson's Address.

Mr. A. E. V. Richardson, Superintendent of Agriculture for Victoria, said he was pleased to have the honour of meeting so many gentlemen interested in agriculture, and would be glad to give them some of his impressions of the United States of America.

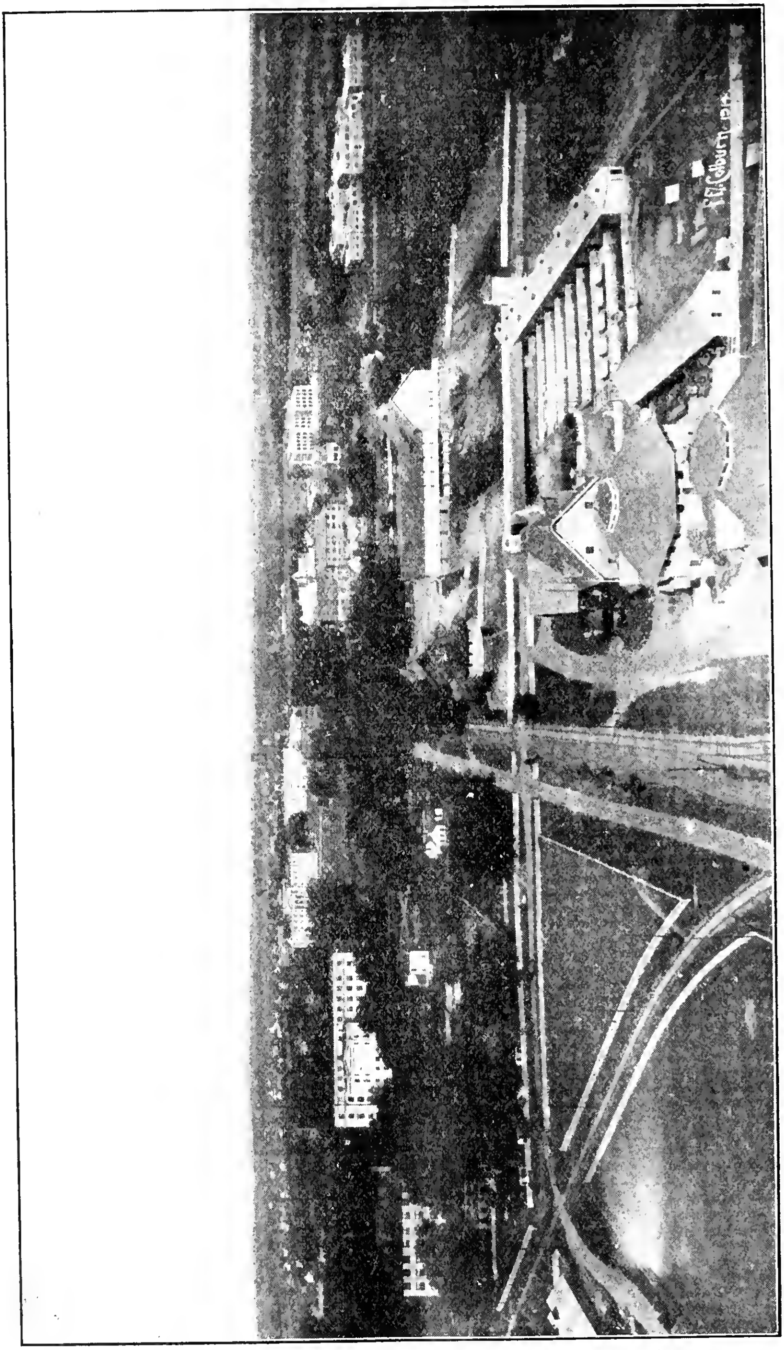
War Efforts of the Americans.

On his visit to the greatest democracy of the world he had been greatly impressed with their wonderful preparations to make the world safe for democracy; in the stupendous efforts they were making for providing for men, munitions, and equipment, building of ships, production, and conserving and sending of food to the Allies. During the past fifteen months America had sent 1,750,000 of soldiers of the very best picked men from twenty-one to thirty-one years of age. She is arranging to send 4,000,000 by next spring, and is prepared to send 10,000,000 more to bring this war to a close. Under the direction of Mr. Schwab, who gave up a salary of 200,000 dollars to work for one dollar per annum for the nation, stupendous efforts are being made to build ships. The shipbuilding programme contemplated the production of five ships of 5,000 tons each a day; or one ship every five hours. By the 1st January next America will be building at the rate of 8,000,000 tons of shipping per annum. That is "going some." Then, as far as the food conservation is concerned, the whole nation went on a voluntary rationing basis.

He saw no wheat bread during his visit. The loaf was composed mainly of substitutes, such as maize, barley, and rice. Through this voluntary rationing, Mr. Hoover, the food controller, was able to send 90,000,000 bushels of wheat in a very critical time to the Allies. Their sacrifices enabled them to provide a large surplus for exportation. A Bill was passed for the appropriation of £15,000,000 a day for war service expenditure. In the matter of money, munitions, food, men, and ships they are doing all that the Allies expected them to do, and a great deal more. No one could fail to be impressed with the capacity of the American people, their enthusiasm for the war, and their faith in their country. After spending six months over in America he was satisfied that we have a wonderful country in Australia. He had spoken at a great many public meetings in the United States, and found that most of the people had never given Australia much thought. The prevailing notion was that it was an island in the Southern Pacific, with an uncertain rainfall and very frequently suffering from drought. He had, however, travelled through the United States when there was a drought. Texas had suffered from a prolonged drought, the Rocky Mountain States had experienced practically a crop failure, and the Government had agreed to provide monetary assistance to farmers in these States. But they did not advertise their droughts in the United States. Similarly in Southern Alberta and Saskatchewan, the southern prairie provinces in Canada, they were suffering from a drought similar to the Victorian drought of 1914. When he asked the Canadians why he had seen no reference to it in the papers they said they got 2,600 settlers crossing the border every month from the United States with their household goods, farming equipment, and capital, and they did not want to cut off that precious system of immigration by crying stinking fish. It would be well for us if faith in the resources of our country were as strong.

Comparison with Australia.

With respect to this small island in the Southern Pacific, he had been able to explain to them that it was big enough to accommodate forty-eight States of the Union, and leave a strip all round the entire continent sufficiently wide to drive a Ford car. An interesting feature for comparison is the population. The whole of our population could be accommodated in one of their cities. While their's numbers 110,000,000, our population is no more than two-thirds of that of the city of New York. The result of this was that the American farmer enjoyed a good home market. Consequently the level of prices was higher there than in Australia, and there was a ready sale for everything raised by the farmers. The centre of their country was remarkably rich, and some of it not unlike the soil of the Horsham plains, but the rainfall came in the summer time, and consequently they grew maize instead of wheat. One-third of the country possessed a rainfall of from 30 to 60 inches; another third 15 up to 30; and the arid regions from 0 to 15 inches per annum. There was a great contrast between central Australia and central America; the latter was watered by the great lakes and the Mississippi and Missouri river systems, and possessed a good rainfall, populous cities, and thriving agriculture. One great advantage we had in Australia was climatic. Practically the whole region corresponding to our agricultural country was frozen over in



View of Campus of Iowa State Agricultural College.

winter time, and the temperature ranged from 10 to 30 degrees below freezing point. For four months in the year they have to house their stock, but this had compelled them to feed their stock, and they had consequently developed a system of feeding stock which had proved highly profitable. The most prosperous rural communities in the States were those which devoted the largest share of attention to live-stock farming. America maintained 45,000,000 sheep, 60,000,000 cattle, and 68,000,000 pigs on the same area as Australia. Unkind nature had compelled them to conserve fodder for winter feeding, and an American farmer always kept on hand one or one and a half years' supply.

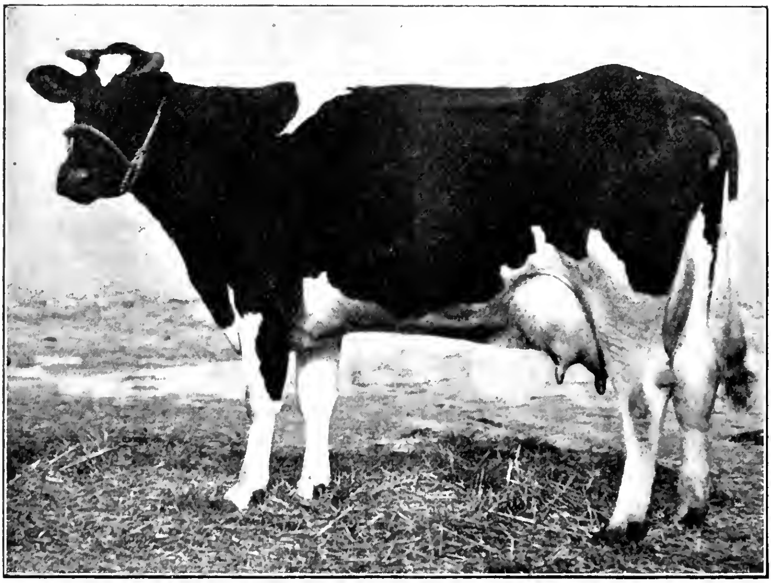
Transportation.

With respect to transportation, facilities in the United States were very strongly developed. A place like Horsham would have three or four railways catering for its traffic, and the efficiency of the railway systems was high; but railways could not do everything; therefore the road system was as important as the railway system. The country system of road-making had proved a failure, because money borrowed to build roads was wasted unless money were provided for their maintenance. The Federal Government of America has appropriated 85,000,000 dollars, to be supplemented by an equal amount by the States, to be expended over a period of five years. The State and Federal Governments co-operate in the building of the roads, and the State Government has to create a State highway commission, under whose control the main roads of the State are centred, in order to secure the benefit of Federal appropriation. Another feature of their transportation is bulk handling. East of the Rocky Mountains wheat is handled in bulk, west of the ranges in bags similar to the Australian method. The great advantages of bulk handling were saving of bags, saving in labour, saving in time, and it permits proper grading and cleaning of the grain and brings the careful farmer a substantial premium. Elevators were built at an approximate cost of 2s. a bushel for terminal elevators and 1s. a bushel for country elevators; while storage charges were very reasonable. Generally speaking, the elevators were filled three or four times during the year. An interesting feature was the size of the farmsteads. In the eastern States they averaged 80 acres, in the middle west 160 acres, and in the west 240 to 320 acres, averaging smaller holding than in Victoria. The State of Iowa, two-thirds of the size of Victoria, grew 324,000,000 bushels of maize, and maintained last year 10,000,000 pigs and 3,000,000 dairy cows; while the diversification of their agriculture was marked.

Diversified Agriculture.

Here in Australia we follow a one-crop system. Wheat is our main crop, and if anything goes wrong with our wheat production the financial system of the country is interfered with; but in America wheat, oats, barley, and sugar are all staple crops, and it is not a one-crop country. They grow 3,000,000,000 bushels of maize and 1,000,000,000 bushels of oats, 80 per cent. of which is fed to stock and 800,000,000 bushels of wheat, and have 2,000,000 acres in flax. We in Australia import annually £500,000 worth of flax products, all of which can be raised in Victoria. Sugar to the amount of 800,000 tons is made from beet, millions of acres are laid down in lucerne, and millions of tons of lucerne hay are made.

Sugar beet was introduced by the Mormons, who transported all the material of their sugar factories on ox waggons, over 1,000 miles, from St. Louis, some 70 years ago, to Salt Lake City. In the State of Utah they say three things conquered the desert—Brigham Young, irrigated sugar beet, and lucerne. America was neither a one-crop country nor a one-stock country, because the Americans had developed all types of stock, and now own 60,000,000 head of cattle, 68,000,000 pigs, and 45,000,000 sheep. It has extensive irrigation schemes that has made the desert bloom like the rose. There are over 4,500,000 acres under irrigation. A word or two about the live-stock



Geneseo Belle Polkadot.

A Holstein giving 20,816 lbs. of milk, and 732.9 lbs. butter fat; half-sister to the world's record milk cow, Tilly Alcarta. (State Agricultural College, Iowa.)

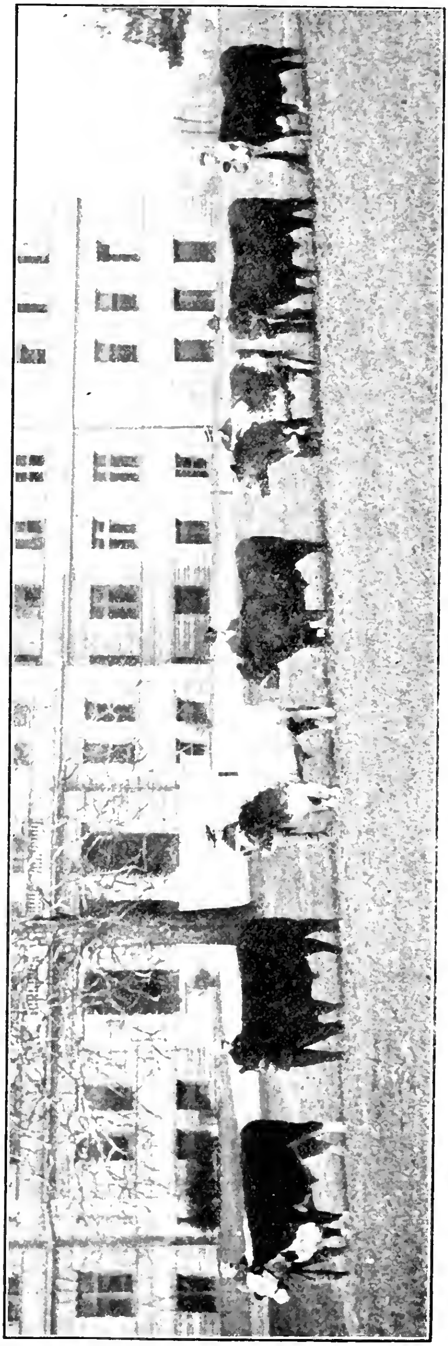
industry. Wherever you get a country where most of the feed is roughage grass or hay you find sheep predominant and grazing cattle. The United States produce far more grain in proportion to roughage than Australia; therefore pigs and dairy cattle predominate. Barley is the crop that struck him as being able to stand in the same relation to the stock industry as maize in America. They have a curious system of selling stock by live weight. They have commission agents representing farmers and buyers representing the big packing plants. As soon as a sale is made the stock are run over a weighbridge and sold on live weight. The advantage is that the farmer knows exactly how much maize and how much lucerne hay or other foodstuffs is necessary to produce a pound of pork or beef, and he further knows by the price of maize whether it will pay him to sell his maize as maize or feed it to pigs and sell it as pork. There are no local slaughter-houses, all the stock being slaughtered at

the big primary markets. All the sheep, cattle, and pigs are brought into these central slaughter-places and sent back in refrigerating cars. The great advantage is that the packing companies are able to sell carcasses of cattle for actually less than they pay to the farmers for them; this is because of the high value of the by-products. They make £5 a head out of the by-products of all the cattle slaughtered in Chicago. With respect to the breeds of cattle, he had found that in the United States they had special types of cattle for special purposes. For beef they bred the Shorthorn, Hereford, and Aberdeen Angas. When transported long distances the law required that they should be provided with water, and cattle and sheep fed with hay, and pigs with maize. Stock in America used to be sent to market at three, four, or five years; but they now find it more profitable to get them to a marketable stage at two years of age. Wherever you go you find Holstein cows. They are milk factories. The standard ration for a 1,000-lb. cow is 35 lbs. ensilage and 15 lbs. of hay, but no cow could keep up a yield of 5 gallons a day, no matter how much silage and hay she got, because of the bulky nature of the forage. Therefore the practice is for any cow that gives over 2 gallons of milk a day to receive 1 lb. of concentrate (bran gluten, or cotton seed meal, or brewer's grains) for every ½ gallon of milk. Other types are the Jersey, Guernsey, and Ayrshire. With regard to pigs, there are two classes—the Duroc-Jersey and Poland China—which produce the largest quantity of fat, and are known as lard hogs. Less common are the Berkshire, the Yorkshire, and Tamworth, which are used for bacon purposes. Our American cousins know how to produce cheap pork. They regard a pig as essentially a grazing animal that will make the most economic gain when he is given good pasture, such as clover or lucerne and grain. They believe in feeding him, and the pig is allowed to take as much grain and tankage, or meal scrap, which is a by-product of the meat factory, as he will eat. The feed is placed in an automatic feeder, similar in principle to those used in poultry runs. The American says he can trust the pig's appetite. He won't gorge himself if he is placed in a rape or lucerne paddock and supplied with a self-feeder containing maize and tankage. Tankage and grain (maize or barley) is the most economical diet, especially if used as supplementary to lucerne grazing, and results in production of pork at a minimum cost. During the early stages the pig is allowed plenty of exercise and pasture. The low temperature in winter and the uncertainty of the rains in summer in the western plains make wheat growing more hazardous than in Australia. American farmers did not give him the impression of cultivating their land as well as the average Wimmera farmer. They plough deeply, but the soil is of a different character from that of the Wimmera plains. They are, however, very systematic in their crop rotation. Grain sorghum, one of the best drought-resisting crops, of which millions of acres are sown annually in the United States of America, is cultivated in large areas.

As a result of 152 experiments conducted by the United States Officer on Irrigation Investigation, it had been found that in the western States of America 15 to 20 inches of irrigation water, in addition to an average rainfall of 10 inches, was necessary to get profitable crops of sugar beet. In the Maffra district, of Victoria, where the infant sugar beet industry is being developed, the rainfall is too uncertain to make

profitable sugar beet production every year. During a period of twenty-five years, the record showed that there were eight seasons when the rainfall during the growing period of the crop was between 6 and 8 inches, and that only in ten seasons out of 25 were the conditions good enough to insure profitable crops. This indicates the necessity for supplementing the rainfall with irrigation; and irrigation promises to place the Maffra area on a sound agricultural basis.

He had been very much impressed with the value of barley for a district such as this. We could get two bushels of Cape barley in an average season for every bushel of wheat; it being a better drought resister than wheat. Some varieties of barley would not stand up well, and we have not yet learned as much about its cultivation as about that of wheat; nor have we learned the best method of using it for stock feeding or grazing for either cattle or sheep. It makes excellent ensilage, and if grown for such purpose would yield from 40 to 50 bushels in a good season. We have reached 80 bushels on Longerenong plots on two occasions during the last six years. Barley would enable us to bring about a diversified system of agriculture. We would have to get away from our one-crop system, diversify our agriculture, and develop our live-stock interests if we were to aim at fully utilizing our agricultural resources.



Steers fattened for market (Ohio College of Agriculture, Columbus).

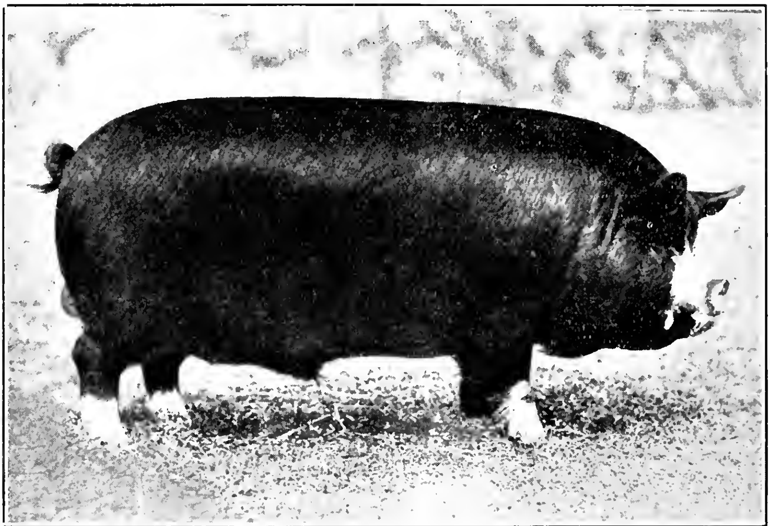
Agricultural Education.

The people of the United States regard educational efficiency as an essential safeguard to democracy, and hold the view that an efficient system of agricultural education is an absolute necessity for national progress. The Federal Government and State Governments spend enormous sums on agricultural education because it is recognised that the money spent is returned many times over in increased prosperity. They are a businesslike and practical people, and have the reputation of requiring a dollar's worth for every dollar expended. The national bill for agricultural education in the United States, for investigation and agricultural extension work, exceeded £12,000,000. Canada is also devoting large sums to agricultural education. The Dominion Government expends a million pounds a year on a Federal Department of Agriculture, and under the Agricultural Instruction Act a sum of £225,000 a year is provided towards defraying the cost of agricultural education in the Provinces. Development is the central thought in educational activity, and the development of American agriculture to its highest possible limit, both as a business and as a mode of life, is the purpose for which the agricultural institutions were founded and supported by the people.

It has been said that the added wealth of the State of Wisconsin each year, as a result of the Agricultural Experiment Station work, is many times the whole appropriation made by Wisconsin for agricultural education. Of the seven tests widely used in dairying, six originated at the Wisconsin Station. The Babcock Fat Test, invented in 1890 by Dr. Babcock, furnished a simple means of paying for milk on the basis of quality and detecting fraud. The greatest service of the Babcock Fat Test is that it makes possible the improvement of dairy cows by eliminating the unprofitable animals, and gives a scientifically accurate foundation for dairying. In addition to the Babcock Test, the Wisconsin Curd Test, the Sediment, Moisture, and Acid Tests are in general use. The work of the Wisconsin Dairy School has enabled Wisconsin to gain first rank among the States in the production of butter and cheese. Since the dairy school was established, the value of the Wisconsin dairy products has increased from 4,250,000 to 16,000,000 pounds a year. Moreover, the substitution of improved pedigree seed of oats, maize, and barley, evolved at the experiment station, in place of scrub varieties, has added millions a year to the cereal yields of Wisconsin. Wisconsin, which is two-thirds of the size of Victoria, now produces 100,000,000 bushels of oats, 70,000,000 bushels of maize, and 23,000,000 bushels of barley, besides being the leading dairy State of the Union. Each experiment station receives an annual appropriation of £6,000 from the Federal Government, and this is supplemented by State expenditures to the extent of £10,000 a year.

The most significant development in agricultural education during recent years is the growth of the extension of publicity work. The experiment stations and colleges during the past twenty-five years have accumulated a mass of exact agricultural information which, if it could be applied in practice on farms of the country, would immeasurably increase the agricultural output. Consequently an organization has been created for reaching the last farm and the last farmer. One form of

extension work is the development of the county agent scheme. In the majority of the 3,000 counties of the States county agents have been installed. These are highly qualified agriculturists. Their offices, located at the county seat, acts as a clearing house for the dissemination of agricultural information among the farming community. The main problem of the county agent is to reach and give service to the largest possible number of persons in his county, and to bring about the greatest possible increase in agricultural efficiency. The less progressive a farmer is the less he troubles to find out what his neighbours are doing. Consequently the great aim in any scheme of extension work is to reach out and get in touch with those who secure but average to poor yields of crops, and who keep average to inferior animals, for these are the sections of the farming community who bear down the average yields



Berkshire Boar, "Epochal."

Four of Epochal's progeny were sold for 10,000 dollars each. A world's record.

of the State. The big work of the county agent is to help the community to discover itself, to encourage the many to follow the example of the few, and to introduce new methods, new crops, and new industries.

Agricultural education was a vital necessity for the forward development of our agriculture. States which were comparable with Victoria in size, population, climate, rainfall, and resources were spending five to ten times as much as we were in agricultural education.

Thus, of all States in the Union, Kansas, perhaps, more closely resembled Victoria in stage of development and resources. Kansas and Victoria were the same size, had the same population and rainfall. North-western Kansas had a rainfall of 8 to 10 inches; Eastern Kansas a rainfall of 40 inches. Yet Kansas produced in 1915 180,000,000 bushels of wheat, 170,000,000 bushels of maize, 43,000,000 bushels of oats, 4,000,000 tons of hay, and maintained 3,000,000 pigs and

4,000,000 cattle. Victoria, in the same year—the best in her agricultural history—produced 58,000,000 bushels of wheat, 1,000,000 bushels of maize, and 8,000,000 bushels of oats. Her production compared with Kansas was trifling, and yet Kansas, thirty years ago, was regarded as beyond the safe limit of cultivation. It was related that, years ago, prairie waggons used to start from the east coast with a legend "Kansas or Bust" painted on the side. On the return journey the waggons were content to put the simple slogan "Busted" on their sides.

Kansas now had over 2,000 students attending her Agricultural College. The total number at present in Victorian colleges was less

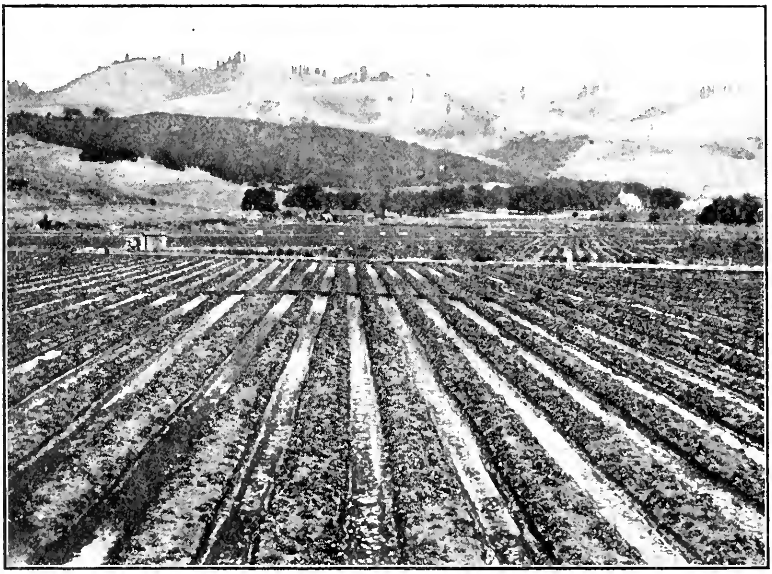
Method of Irrigating Sugar Beets in Colorado.

than 100. Kansas spent £200,000 on her agricultural college last year, while the total expenditure on agricultural education on the colleges in Victoria was less than £20,000.

Agricultural Education a Matter of Public Concern.

If the development of agriculture were merely the concern of the farmers, we might leave them to provide for it themselves, or let matters rest as they are. But in the final analysis the development of agriculture is a public question. Our expenditure on the war has already assumed large and oppressive dimensions. The interest on the increasing loans will have to be met, and the loan must ultimately be redeemed. We must

look to increased production from the soil to meet these burdens. Every day in the year the farmers of Victoria produce £100,000, or £40,000,000 per annum. Every bushel an acre added to Victoria's wheat yields means half-a-million extra income. Every disease, insect, and fungus we learn to control saves enormous wealth to the country. Every contribution to our knowledge of stock feeding, stock management, and dairying is of direct benefit to the whole community. Hence money wisely spent on agricultural development is money invested which will ultimately return a high rate of interest. The amount now spent on agricultural development is trifling in comparison with the total value of our agricultural production. History shows that great countries have always developed their educational institutions in times of adversity. The American College of Agriculture and the United States Department of Agriculture were born in the midst of the civil war. When



Irrigating Vegetables for Canning in Southern California.

Schleswig-Holstein was torn from Denmark she sought refuge in agriculture. France, after the Franco-Prussian war, developed her educational systems, and with what result we see to-day.

A long-range policy for agricultural education is required. A long time is required to realize upon educational work, and continuity of effort is essential. We therefore need a bold policy which will look beyond the immediate present and map out the requirements of the State for the next ten years and make provision for its steady accomplishment. (Applause.)

At the conclusion of the prolonged applause which followed his address, Mr. Richardson, by means of lantern slide pictures on a screen, forced home some of the many points in his lecture; giving ocular corroboration of his remarkable statements.

THE REARING OF DUCKS.

By A. Hart, Chief Poultry Expert.

Ducks for Export.

The excellent results obtained in the past from the trial shipments of ducklings sent to Great Britain from Victoria have proved satisfactory to all parties interested in the export trade. It certainly has been very encouraging to breeders, and there appears every indication of a very valuable and extensive business being established in the export of ducklings and poultry to the London market, *provided that the birds sent are suitable to the requirements of the trade.* This point, coupled with the fact that trial shipments are looked upon by the London dealers with a certain amount of suspicion, indicates that payable prices will be obtained when a suitable market is experienced and shipments of ducklings are regularly made. There is an almost unlimited demand for both ducklings and chickens in Great Britain, and the enormous quantity of poultry consumed there every year should certainly be, to a certain extent, supplied by this and our neighbouring States.

The main requisites towards a successful export trade from Victoria to Great Britain are as follow:—

1. The breeding of birds which will command the highest value in the London market.
2. The rearing and fattening of the birds at as early an age as possible.
3. The killing, grading, and packing to be performed with great care, so as to insure the poultry being landed in good condition and presenting a good appearance, and therefore likely to prove satisfactory to the consumer.
4. Selecting the proper seasons for shipment of both ducklings and chickens.
5. A proper supervision at the receiving depôt, and the appointment of direct agents, who will give the industry their undivided attention, and thereby minimize the cost of handling and placing on the market.

Any industry that is to be successful has to be established on a sound basis, and to grow and develop with time and experience. There are, however, very encouraging prospects offered in the export trade of ducklings, and breeders have the final result practically in their own hands. If they begin on correct lines and produce birds which are of the requisite quality and condition, it is quite probable that this industry may assume very large proportions in the near future.

Hints to Beginners.

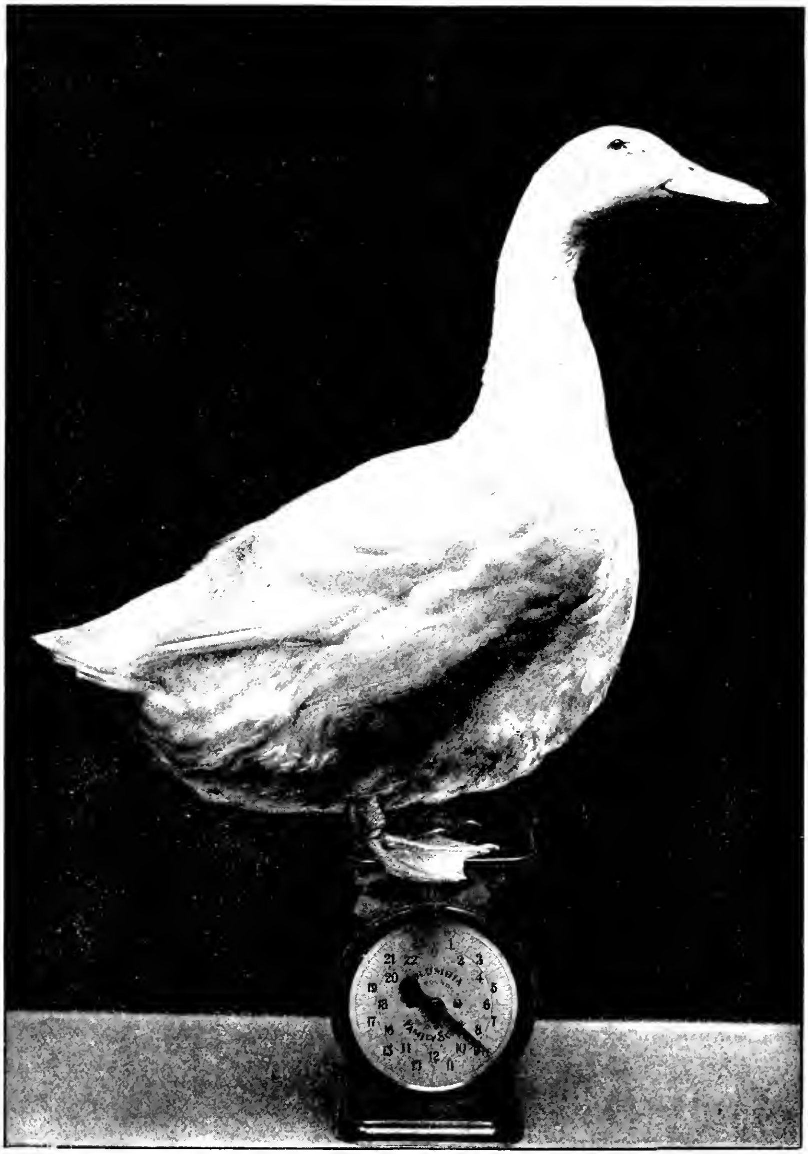
To obtain the best results in breeding for market it is necessary to start with pure-bred stock, and for the breeder to set eggs from his own birds.

Aylesbury drake with Pekin ducks makes a suitable cross for export. Allow three or four ducks to each drake. This cross matures quickly, and grows to a large size, with flesh of good flavour, colour, and texture.

Use first season drakes with second season ducks.

See that breeding ducks are comfortably housed in cold weather, so as to keep up the egg supply. A ground floor is the best for ducks. It should be of clay, well rammed down, and raised a few inches above the level of the ground.

All ducks should be bedded down with straw, pine needles, shavings, &c., in the laying season, so as to keep the eggs clean.



Young Aylesbury Duck. Weight, 9 lbs.

A variety of food should be given to the drakes during the breeding season, as a vigorous condition is necessary to fertilize the eggs.

Breeding pens of ducks should be kept strictly to themselves.

Access to water should be allowed occasionally to breeding ducks if the best fertilizing results are to be obtained.

Ducks should not be allowed in the water when the weather is very cold or frosty.

Young Pekin Duck. Weight, 8 lbs.

All duck eggs should be tested on the seventh day of incubation, and the infertile eggs removed. Night is the best time for examination. Infertile eggs may be given to the young ducks.

A cheap foster-mother for young ducks can be made out of a kerosene case placed on the flat. Put a flat quart bottle filled with hot water in the centre of the box. Cover it with brown paper, and then put sawdust, chaff, or straw over it. This will provide warmth for the ducklings, but it should be used only where small numbers are being reared, or where proper brooders cannot be obtained. Young ducks do not require quite as much heat as chickens, and can do without mother or brooder when about four or five weeks old.

Incubators that allow of plenty of moisture to the eggs are the most suitable machines for hatching duck eggs.

The best green stuff to grow for ducks is maize, which should be cut young. Silver-beet, thousand-headed kale, lucerne, rape, and all other green food should all be chaffed and mixed with the soft food.

To start young ducks, and also young ones after moulting, to lay, use maize meal with a little green cut bone for the winter months in their morning meal.

The best food for old ducks is two parts pollard, one bran, one lucerne, and chaff. The chaff should be scalded and steamed in a covered vessel. All food should be given fairly soft, and fed in "V"-shaped troughs, with bars over the top so that the birds cannot get into the troughs and spoil the feed. Care should be taken to mix the food thoroughly, and to see that none is left, as it may become sour and cause diarrhœa.

If meat soup is available, it should be used to moisten the food. Animal food is, of course, a great aid to egg production, and ducks can assimilate a larger percentage of meat food than fowls. All animal food should be given in a cooked form, and the quantity regulated according to the discretion of the attendant.

If young ducks are desired to mature quickly, the best food is pollard, barley meal, bran, rendered fat, and skim milk. Nothing will mature them quicker than milk. All meal should be scalded, and drinking water given occasionally. Give them a little bone meal twice a week in their morning food. It will promote growth and also prevent leg weakness.

All grit should be given to ducks in water, using a shallow dish so that they cannot get their eyes under the water. Grit masticates the food, and increases condition and also egg supply.

Ducks require water to wash in, so as to keep them clean. If the soft food is allowed to clog about their eyes, it gives them an unsightly appearance, and renders them more liable to ailments of the head and eyes.

Young ducklings should not be allowed free access to water until they are, at least, four or five weeks old. Water in a trough with bars over it should be provided, having the trough a sufficient depth, so that they can wash their heads and faces.

Ducklings for market should not, however, be allowed in water. All young ducklings, when being fattened for market, should be penned as even in size as possible, otherwise the smaller ones will not get as much food as the larger, and their size and growth will be retarded. Lots of 25, or less, should be placed in each pen.

Cottage holders should make the nests on the ground when using hens to incubate duck eggs.

Thermometers should be tested every season, as they are very liable to get out of order.

The best age at which to market ducklings is from nine to eleven weeks, and while they are in their first feather.

Farmers, in sending birds to market, should grade them as near to age, weight, and condition as possible. Condition and uniformity in size will always top the market, either in London or locally.

The best months for matured ducks in our local markets are June, July, and August.

The best months for shipping ducklings from Melbourne to the London market are November, December, and January.

Indian Runners and Muscovy Ducks.

The breed of ducks known as Indian Runners is now bred in two colours—fawn and whites. As layers they have no equal, being easily the best egg-producers of the duck family. They are also hardy and easily reared, and, although the quantity of flesh on them is not nearly equal to that on the larger breeds, a well-fattened runner drake is very fine eating. The fawn runners are the better known, and for this reason are kept in greater numbers than the whites. The latter are, however, very productive layers, and the colour of the skin is somewhat lighter than the fawn, making the dressed birds more attractive to the eye.

In Indian Runners, as in many other breeds, the type has been slightly altered through breeders paying too much attention to exhibition points and neglecting the utility side. But there are still many flocks of runners, which, although they could not score in the show pen, have retained their egg-producing qualities, combined with fairly good table properties. For this reason, I would recommend that this type be kept by the poultry farmer who relies on eggs as a source of profit. In mating runners, from five to six ducks can be allowed to each drake. It is better to err on the safe side by reducing the number of ducks to five or six, as suggested, as this not only means a bigger percentage of ducklings, but is also an important factor in the production of strong, vigorous, and healthy stock. Adult or second-year ducks may be mated to young drakes.

Muscovy ducks, either reared pure or crossed with Pekins, Aylesburys, or Rouens have very deservedly acquired a reputation for table purposes. They are also good sitters and careful mothers, qualities which have made them favorites with many poultry keepers. Being extremely hardy and easily reared, Muscovys are equally suitable for the house where a few fowls are run, and for the poultry farm. They grow and fatten very quickly. Being of a quiet nature, they do not run about much or lose condition by excessive exercise. When fattened and properly dressed, they are very attractive in appearance, and are in every way good table birds. From five to six ducks may be mated with one drake.

Money in Ducklings.

A couple of years since, one Melbourne firm alone exported 10,000 frozen ducks, and this number would probably have been ten times greater if the quality of the birds sent in to market had been of the

desired quality and condition. One point of much value to the producer of ducklings and chickens is that all poultry for export are purchased by weight, and this should induce breeders to feed their birds literally.

Ducklings are more profitable to breeders on a small scale than chickens, as they are hardier, mature more quickly, and can be marketed at little more than half the age. For this reason, the rearing of ducks can be unhesitatingly recommended to those who desire to commence poultry farming in a small way.

COPPER FUNGICIDES FOR VINE DISEASES.

By F. de Castella, Government Viticulturist.

(Continued from page 599.)

Bordeaux Mixture—*continued.*

When operating on a large scale, instead of making up separately each 50 gallons of spray mixture, as described in last issue (page 599), it will be found much more convenient to prepare

Stock Solutions

of each of the spray ingredients, viz., copper sulphate (bluestone), lime, and casein. In this way much valuable time can be saved, it being only necessary, when making the final mixture, to take a measured quantity of each stock solution to make up, say, 50 gallons of bulk, or sufficient to charge a traction spray pump. A large vat capable of containing several 50-gallon lots should prove very convenient. More than sufficient for one day's spraying should not be mixed at one time, but it is evident that a spray pump capable of treating 20 acres per day will need about 1,000 gallons of spray mixture. If several hundred gallons be mixed at once, much time will be saved; it will, of course, be necessary to thoroughly stir the bulk before each withdrawal.

Copper Sulphate Stock Solution.—Take 100 lbs. copper sulphate and dissolve in water to make up 50 gallons; 5 gallons of this solution will be required for each 50 gallons of spray mixture. Do not handle in metal vessels.

In last issue, a 10 per cent. stock solution was mentioned (1 lb. to 1 gallon of water). Copper sulphate being fairly soluble, an even stronger solution may be made, which will have the advantage of being less bulky, and consequently more convenient to handle. Copper sulphate dissolves in four times in weight of cold water, hence it is quite easy to prepare a 20 per cent. solution, or, more correctly, a solution such that every gallon will contain 2 lbs. of the salt. The procedure will be as follows:—Take a 60-gallon hogshead from which one head has been removed; place same on end. Tie 100 lbs. copper sulphate in a hessian bag and suspend it, in the upper part of the cask, to a cross-piece of wood, so that it will be just submerged on filling the cask with

water to the 50-gallon level. Solution takes place rapidly; as the crystals dissolve the liquid bathing them becomes more dense and streams to the bottom of the cask and is continually replaced by less concentrated and consequently lighter liquid. Owing to the automatic circulation thus set up, solution is complete in a few hours; after stirring, the cask will contain 50 gallons of stock solution, which will keep indefinitely, and of which 5 gallons will be required for each 50 gallons of Bordeaux mixture.

Stock Lime Milk.—Take 40 lbs. pure quicklime, make up to 17 gallons with water; one gallon of this milk will be required for each 50 gallons of spray mixture.

The specially selected lime packed in air-tight tins, now obtainable, will be found very convenient for the preparation of a stock lime milk of standard strength, such that a definite measured quantity will contain a known weight of lime. It has been shown (p. 596) that 2¼ lbs. pure quicklime is sufficient to bring about the first signs of alkalinity in a solution containing 10 lbs. of copper sulphate. The following procedure will be found convenient:—

Take a tub of about 20 gallons capacity in which the 17-gallon* level is marked with a peg. Tip the contents of a 40-lb. tin of lime into the empty tub and slake in the ordinary way by sprinkling several times with a little water. When thoroughly broken up make up to the 17-gallon level with water; after stirring a few times a milk will be obtained of such strength that one gallon will be the correct dose for 50 gallons of Bordeaux. This milk should be prepared a day or two before use and should be well stirred immediately before each withdrawal. When using, dilute with about four times its bulk of water and pour into the Bordeaux through a fine sieve to get rid of gritty particles; unless thus diluted it will be found difficult to strain at the above concentration. When making the Bordeaux, test occasionally with phenolphalein paper to make sure that neutralization is complete; if the paper does not turn pink add a little more lime milk. This is specially important when casein is to be added; unless the Bordeaux be at least slightly alkaline the casein solution would be curdled.

If commercially pure lime be not obtainable, a stock milk may yet be made up with ordinary quicklime—the fresher the better—exactly as described above. It will be found, however, that rather more than one gallon of the resulting milk will be required for each 10 lbs. bluestone (50 gallons of Bordeaux),) how much more will depend on the quality of the lime. When mixing the first 50 gallons of Bordeaux a record should be kept of the quantity of lime milk needed to induce the first signs of alkalinity (test paper turns pink). A similar quantity will naturally be needed for each 50-gallon lot.

Casein Stock Solution.—Take 10 lbs. casein, dissolve with the aid of either lime or washing soda and make up to 4 gallons with water. One pint—a pannikin is a convenient measure—will suffice for each 50 gallons of spray. The solution may be made in two different ways.

(1) Mix the casein with about an equal bulk of dry slaked lime. Take a small basin, fill about three parts full with water, tip the mixture of lime and casein on to the surface of the water. If an ordinary

* Strictly speaking it should be 17¾ gallons. Even the test lime usually contains about 5 per cent. impurities: the reduction of the "milk" by ¾ gallon will approximately compensate for this.

egg-beater be now immersed in the water it will be found on rotating the handle that the lime and casein are entirely sucked into the water with which they are immediately incorporated. The casein dissolves, or rather forms an emulsion, after a while, but the greater part of the lime merely remains in suspension.

(2) Incorporate the casein with the aid of an egg-beater, as previously described, in a 10 per cent. solution of soda carbonate at the rate of 10 lbs. to 4 gallons. Some confusion exists in connexion with the term carbonate of soda, which is really the correct term for washing soda, and not for baking soda, although the latter is sometimes sold in grocers' shops under the name of carbonate. The correct term for baking soda is bicarbonate of soda.

The casein solution should be made up a day or two before use, and well stirred before each withdrawal. If prepared by the second method there may be a slight tendency to scorching of the foliage owing to the presence of small quantities of carbonate of copper in the resulting Bordeaux; on the other hand, it will tend to render this slightly more active, immediately after application, by increasing the immediately available soluble copper.

Choice of Lime.

With the lime packed in air tight tins, previously referred to, no trouble will be experienced, but with the lime usually obtainable from country stores attention to certain points is necessary. The fresher the lime—in other words, the more recently it has been burnt—the better. Fresh lump or "roach" lime should only be used; it should be quite free from powder. Lime deteriorates rapidly on keeping, as was explained in last issue (pp. 594) becoming first slaked and subsequently carbonated under the action of water vapour and carbonic acid present in the air.* If merely slaked little harm will result, it will only be necessary to use somewhat more of it. The action of carbonic acid, however, is far more undesirable. Carbonate of lime is of little use for neutralizing copper sulphate, but the chief objection to lime which has become carbonated is the presence of much copper carbonate in the resulting "Bordeaux," and the scorching of the foliage which frequently results therefrom. Unfortunately both changes occur simultaneously, so that lime which has been stored for a while invariably contains more or less of the undesirable carbonate. Analyses of lime kept in store have shown that even after two months' storage it may only contain 70 per cent. of pure lime, whilst after eight months' storage the lime content may have fallen so low as 48 per cent.†

Slaking of Lime and its Subsequent Preservation.

The importance of the proper slaking of lime is well known to bricklayers and plasterers; vine growers are less familiar with the subject, though it is of equal importance in connexion with the making of Bordeaux mixture. If the lime milk be properly prepared less trouble will be experienced in the way of spray nozzles clogging. It is in fact largely owing to greater freedom from nozzle trouble that copper soda owes its popularity.

* 100 lbs. of pure quicklime, after being slaked would weigh 135 lbs.; when completely carbonated its weight will have increased to 178·6 lbs.

† Millardet and Gayon, 1888.

To properly slake lime it should be sprinkled with a little water, but not completely submerged, and left to itself for half an hour or so. During this time it swells up considerably, cracks and crumbles, and finally falls into powder, hissing, and giving off steam, owing to the heat generated by the reaction. When thoroughly slaked the requisite quantity of water should be added to make the stock milk or cream described above.

The stock milk can with advantage be prepared sometime before use; if too fresh it contains numerous gritty particles usually known as "core"; this mainly consists of fragments of lime as yet unslaked. It is well known by plasterers that freshly prepared "lime putty" often "blows" after being spread on the walls, owing to the belated slaking of particles of lime; similar trouble does not occur if the putty was prepared some time previously. Once made up, the lime milk will keep in good condition, at any rate for a few days. It really consists of lime-water containing an excess of lime in suspension; on resting, the suspended lime falls to the bottom to form a sediment which is protected from the air by the supernatant lime-water. It is true this becomes slightly carbonated on the surface, as is shown by the formation of a slight glassy film, but the deterioration on the whole is very slow.

It is possible that the method of treating lime usually followed by plasterers, may prove a very convenient way of handling lime in order to have on hand a stock always ready for immediate use, and which will keep in good condition and reasonably free from carbonate for several weeks. "Lime putty" is the name given by plasterers to a stiff paste of about the consistency of butter, made by mixing freshly-slaked lime with a sufficient quantity of water. It may vary a good deal in composition; naturally, the stiffer it is the richer in lime. When of the consistency usual in France, it is estimated to contain lime equivalent to 20 to 25 per cent. of pure quicklime.* On this basis, the quantity required for each 50-gallon lot of "Bordeaux" would be from 9 to 11½ lbs. If lime putty were made up to a definite standard of consistency, a measured quantity of it could be taken for each 50-gallon lot of spray mixture. The quantity required could be easily determined with the aid of phenolphthalein test paper when making up the first lot. A large garden trowel would be a convenient measure. For subsequent lots it would only be necessary to take the requisite number of trowelfuls, dilute it in a bucketful of water, and mix into the Bordeaux in the usual way. It would be well to check occasionally, the commencement of alkalinity, with phenolphthalein paper.

As lime putty appears to keep with very little change for several weeks, a fair stock of it could be made up at one time.

Hydrated Lime.

This substance, which is none other than very carefully slaked lime, is largely used in the United States in connexion with cement manufacture, and for other industrial purposes; it is also becoming popular with plasterers in America.

> "Hydrated lime is the powdered product formed by slaking quicklime with the requisite amount of water. The material, as it

* Ravaz. *Progres Agricole,* 16th August, 1918:—"As regards slaked lime in the form of thick pastes, these contain from 75 to 80 per cent. of their weight of water.

comes into commerce, is a very finely divided white powder, and if properly prepared contains no unhydrated particles of lime. For this reason, it is preferable to common lime paste or putty for use with Portland cement, because, if properly manufactured, it is more thoroughly slaked, and is easily handled and measured."*

It is claimed that, if properly prepared, it is very slowly carbonated on exposure to air.

Though hydrated lime does not appear to have as yet been used for preparing Bordeaux mixture, it should prove very suitable for the purpose, though the cost would, of course, be somewhat higher than when using quicklime as previously described.

Admitting it to consist entirely of pure slaked lime or calcium hydroxide ($Ca\ H_2O_2$) with no surplus water, 135 lbs. would be equivalent to 100 lbs. of pure quicklime; in other words, in order to obtain a "Bordeaux" just barely alkaline, instead of taking $2\frac{1}{4}$ lbs. to neutralize 10 lbs. of bluestone, 3.04 lbs. would be required. This could easily be measured instead of being weighed.

Being in a quite impalpable powder, it could be directly mixed in to the 50 gallons of copper sulphate solution, to which it should be added in small quantities at a time with very thorough stirring. It might also be mixed in a bucketful or so of water to form a milk, to be used as previously indicated.

A sample of hydrated lime, manufactured by a Sydney firm, was recently brought under the notice of the writer which appeared to be very suitable for the making of Bordeaux mixture. It is a matter for vine-growers to decide whether the greater convenience would justify the increased cost. The price of the hydrated lime above referred to was £20 per ton. Specially selected quicklime in tins costs a little under £12 per ton, and one ton is equivalent to 27 cwt. of hydrated lime. Ordinary quicklime is cheaper still, and if freshly burnt and carefully used a thoroughly satisfactory Bordeaux will result.

* Taylor & Thompson; *Concrete, Plain and Reinforced* (1917), p. 47.

(*To be continued.*)

A FEW of the best varieties of fruits were raised by scientific cross-breeding, but many standard kinds were the result of accident. Cox's Orange Pippin, a leading dessert apple, was raised by a Bermondsey brewer in his garden at Slough, England, where he had merely sown apple pips. Blenheim Pippin was "discovered" in the garden of one Kempter, a labouring man, who lived at Woodstock, Oxfordshire, more than a century and a half ago. Doyenne du Comice pear was raised in the garden of the Comice Horticole, at Angers, the original tree first fruiting in 1849, so that this delicious pear, one of the very best in cultivation, may be a case in which the seeding resulted from artificial crossing. But the choicest grape of all, the Muscat of Alexandria, is believed to have come from the East several centuries ago, when artificial crossing as a means of raising new varieties can hardly have been practised in Eastern vineyards. For similar reasons, the best apricot, Moorpark, must also be attributed to circumstances other than deliberate cross-breeding.

A CONTRIBUTION TO THE STUDY OF HEREDITARY UNSOUNDNESS IN HORSES.

By W. A. N. Robertson, B.V.Sc., Chief Veterinary Officer.

(*Continued from page* 478.)

FAMILY 7.

This is the largest family dealt with, there being 871 representatives tabulated. Of this number, 106, or 12.17 per cent. were found unsound. The unsoundness recorded is seen scattered through many generations, there being no line of descent in which it is predominant. The family may, therefore, be considered a sound one, and an analysis will show that most of the unsoundness found can be traced through the dams.

The following table summarizes the unsoundness in this family. The table departs slightly from that of other families, inasmuch as sub-family 7.3 has been divided into branches 7.311 and 7.312 to 7.36 This is done for the reason that through 7.311 we have the largest branch of any family recorded.

TABLE SHOWING UNSOUNDNESS IN FAMILY 7.

Sires.	Sons.			G Sons.			GG Sons.			GGG Sons.			GGGG Sons.			GGGGG Sons.			Total.		
	Examined.	Unsound.	Percentage.	Examined.	Unsound.	Percentage.	Examined.	Unsound.	Percentage.	Examined.	Unsound.	Percentage.	Examined.	Unsound.	Percentage.	Examined.	Unsound.	Percentage.	Examined.	Unsound.	Percentage.
7·1 ..	..	..	..	..	..	..	26	3	11·5	25	2	8·0	4	0	..	..	..	..	55	5	9·09
7·2 ..	2	1	50·0	39	2	5·1	45	9	20·0	43	10	23·2	41	7	17·0	5	0	..	175	29	16·5
7·3 ..		**7·31**			**7·311**		..	..	..	209	19	9·0	217	18	8·2	41	5	12·2	467	42	9·0
		7·312 to 7·36		4	1	25·0	8	2	25·0	54	5	9·2	9	1	11·1	..	..	..	75	9	12·0
7·4 ..	..	..	..	17	6	35·3	35	8	22·8	33	5	15·1	6	0	..	1	0	..	92	19	20·6
7·5 to 7·7	3	1	33·0	3	1	33·0	1	..	..	..	..	..	..	..	..	..	..	..	7	2	28·5
Totals	5	2	40·0	63	10	15·8	115	22	19·1	364	41	11·2	277	26	9·3	47	5	10·2	871	106	12·17

The descendants of 7.1 show 9.09 per cent. unsoundness. Most of this can be shown to have been transmitted through the blood of the dams, as follows:—

7.12111 was from a mare by a son of 3.1; very unsound line.
7.12102 was from a mare by 2.18. granddam by son of 3.
7.12108 was from a mare probably by a son of 3.
7.12182 was from a mare by 7.492, which, though apparently sound, appears frequently in unsound pedigrees.

The dam of 7.121006 cannot be traced.

Through the progeny of 7.2 we find 16.5 per cent. unsoundness, the descendants of 7.21 showing none, though many mature animals were seen.

7.22 shows four unsound descendants, of those which can be traced on the dam's side, 7.2216 and 7.2219 were from the same mare by 1.335—apparently a sound horse, but of very unsound family; the dam of 7.22107 was by 3.1, a very unsound line. There is, therefore, presumptive evidence of the taint having come down through the female side, for a large number of the progeny examined was 5 years old at examination; had the sire been responsible, a greater number would have been unsound.

7.23 shows more unsoundness in his progeny than any other individual of this family. The unsoundness appears to have come through 7.2311, which was from a mare by 4.12, an unsound line—the taint was probably carried to his sons, and accentuated by mating with mares of tainted breeding, for we find that—

7.23111 and 7.23112 were by brothers not recorded in these tables.
7.23118 was from a mare by 9.311, an unsound line.
7.231103 was from a mare by 1.031, an unsound sire.

The remaining members cannot be traced through their dams.

Of the other unsound descendants of 7.23, a search through their pedigrees shows the following:—

The dam of 7.2313 was by a son of 1.
The dam of 7.2314 was by either 4.13 or 4.21, of unsound family.
The dam of 7.231215 was by 21.19, apparently sound; the granddam was by 7.492, already referred to.
The dam of 7.231231 was by 3.3, an unsound line.
The dam of 7.231551 was by 1.031; she was also dam of 7.231103 above.
The dam of 7.23152 was by 4.12, probably unsound; the granddam was by 3.
The dam of 7.231743 was by 9.51, a tainted line.

The remainder cannot be traced.

7.24 was unsound; his dam was by the sire of a very unsound family. Only one of his sons has been found unsound, the others being mostly 3-year-olds. The unsound son was from a mare by 9.31, a sire of unsoundness, and the granddam by 38, showing that when there is taint on both sides unsoundness appears at early age.

7.25 was sound as an aged horse, and a number of his progeny were 4 and 5-year-olds at examination, and found sound, yet one, 7.254, was unsound at 4 years old; the dam of this horse was by 2.2102, an unsound horse.

We come next to consider 7.3. This sub-family is dealt with in two divisions, that through 7.311 being one in which 467 horses have been examined, whilst from the remaining sons of 7.3 only 75 horses have been recorded.

None of the sons of 7.311 has been examined, but in 209 of his grandsons 9 per cent., or 19 only, were found unsound. Unfortunately, the dams and granddams of a number of these cannot be traced far enough to connect with sires in these tables. As far as can be ascertained, they show as follows:—Ten of the sons of 7.3112 were examined; three were

unsound. Of these, 7.31124 was from a mare by 3.2—an unsound horse—the remaining two cannot be traced. Perusal of the table shows that the sound sons were of mature age when examined, and thus it is to be inferred that the sire was sound.

In the progeny of 7.3113 there are two unsound. The dams of these cannot be traced, but as there are a number of 5-year-olds recorded as sound, one cannot think other than that the line is a sound one, and that the unsoundness recorded is not hereditary on the sire's side.

No unsoundness is found in the progeny of 7.3114 or 7.3115. Sixty-eight descendants of 7.3116 have been examined, and 7, or 10.3 per cent., found unsound. In those cases in which the pedigree can be traced unsoundness on the dam's side is found as under:—

The dam of 7.311610001 was by 1.1021, an unsound horse; the granddam was by 3.1, of unsound family.

The dam of 7.311610004 was by 7.3112, apparently sound; the granddam was by 3.

The dam of 7.3116100009 was by 3.2, of unsound family.

The dam of 7.3116182 was by 7.2311, previously referred to, who was out of a mare by 4.12.

The dam of 7.3116185 was by 2.526, apparently sound; the granddam not recorded.

The dam of 7.31161032 was by 1.815, which, though sound at examination, was of unsound line.

Forty-three descendants of 7.3117 are recorded, and only two are unsound, viz., 7.311704, from a mare by 4.42111, which appears frequently in unsound pedigrees, and 7.3117001, which cannot be traced on the dam's side.

7.31101 was apparently sound; 37 of his progeny show only three unsound. The majority of those examined were mature horses, and if unsoundness was present as a factor on the sire's side in this generation, it would undoubtedly have shown in at least some of the sons. In the case of the unsound grandsons, the dam's breeding cannot be traced.

7.31102 shows four unsound out of twelve examined. The percentage is large. This horse has the reputation of being sound. This is probably so, for the unsound sons were from mares with the following breeding:—

7.311023 was from a mare by 7.2315, apparently sound; the granddam was by 4.12, of unsound line.

The dam of 7.311026 was by 4.1263, a grandson of 4.12.

The dam of 7.311024 was by 7.26; the granddam by a son of 3.

The dam of 7.3110204 was by a son of 3.

7.311031 shows one unsound son—he was out of a mare by 4.12; the granddam was by 7.231.

The next sire to consider is 7.31104. He had 41 sons and 2 grandsons examined. Three sons were unsound, viz.:—

7.3110408, from a mare by 2.18, the granddam by 9.51, of unsound line.

7.311043, from a mare by 3.2, of unsound family.

7.31104005, from a mare by 3.12, of unsound family.

As eleven of the sound sons were 5 years old or over, and eight were 4 years when examined, there can be little doubt that the unsoundness was introduced by the female side through the lines mentioned above.

The next family worthy of comment is that of 7.311004. Forty-seven descendants were examined, and six, or 12.7 per cent., were unsound. A large number of mature horses were examined, and if unsoundness was a dominant factor on the sire's side, it should have appeared more frequently in them. The inference is that the line is sound, and the introduction of unsoundness is, no doubt, due to other blood. A search of pedigrees shows that—

7.31100404 was from a mare by a grandson of 22, of an unsound line, and already shown as a relation of 1; the granddam was by 4.13, of tainted line.

7.311004003 was from a mare by a son of 9.51, an unsound line, referred to above.

7.311004005 was from a mare by 3.153, sound as a three-year-old, but of unsound family, and whose only son examined was unsound.

7.311004008 was from a mare by 4.12 already referred to; the granddam was by 22.

7.31100461 was from a mare by 3.101, of unsound line, and whose only son examined was unsound; granddam was by son of 1.

7.31100467 was from a mare by 7.31104, and the granddam by a son of 3.

There is, therefore, sufficient reason for unsoundness appearing in these members.

The remaining descendants of 7.311 show 10 per cent. unsoundness in the 74 members examined. The dams of these unsound ones which can be traced show as follows:—

The dam of 7.31100811 was by 7.231.

The dam of 7.311008102 was by 4.42111; the granddam by 4.1222.

The dam of 7.31100945 was by 9.312; the granddam by a grandson of 1.

The dam of 7.31100909 was by a son of 3.1.

The dam of 7.311000142 was by a son of 6A; the granddam by 4.42111.

The dam of 7.311000143 was by 1.0541.

Unsoundness runs through most of these lines, and its appearance in these horses is not surprising.

Passing now to a consideration of the descendants of 7.312 to 7.36, 12 per cent. unsoundness is recorded, and that the dams are responsible can be shown in the following cases.

The descendants of 7.312 were all sound.

The descendants of 7.313 were sound with two exceptions, viz., 7.31331, which was from a mare by a grandson of 1, and 7.31332, whose dam's pedigree is incomplete.

The unsound descendant of 7.315 was from a mare by a grandson of 1; the granddam was by 1.

7.331133 was from a mare by 7.24, an unsound horse; the granddam by 1.33; the great-granddam by 38.

7.4 shows 20 per cent. unsoundness in the five generations recorded. That this was not a dominant factor on the sire's side may be reasoned

from the fact that five aged sons of 7.41 were examined and found sound, and two were unsound. One of these, 7.4101, was from a mare by 9.3, of unsound family; the other cannot be traced. Of the grandsons of 7.41, 7.4147 was from a mare by 1.15, of unsound blood; the sound ones were all of mature age.

Three sons of 7.42 were seen, and all were unsound. This unsoundness could not have originated from 7.4, for a study of the age of his descendants shows that 38 were sound at 5 years of age or over. It may have been introduced through 7.42 himself, whose dam's pedigree cannot be traced. It is more likely to have come from the dam's side of the three sons, for two of them, 7.421 and 7.423, can be shown to be by the same horse, a son of 3.2, of very unsound blood.

It is thus seen that there is every support to the opening statement that the family, considered from the sire's side, may be regarded as sound, and that the unsoundness present has been introduced from outside tainted sources.

FAMILY 7.

7	7·1, not examined	7·11, not examined	7·111, not examined	7·1111, sound, 3		
				7·1112, sound, 4		
		7·12, not examined	7·121, not examined	7·1211, not examined—	7·12111, **sidebone**, 4	7·121111, sound, 3
						7·121112, sound D.A.P., 3
				7·1212, sound, 3		
				7·1213, sound, 3		
				7·1214, sound, 3		
				7·1215, sound, 5		
				7·1216, sound, 4		
				7·1217, sound, 5		
				7·1218, sound, 5 —	7·12181, sound, 4	
					7·12183, sound, 5	
					7·12182, **sidebone**,5	
				7·1219, sound, 4		
				7·12101, sound, 4		
				7·12103, sound, 5		
				7·12105,sound, 5—	7·121051, sound, 3	
					7,·121052, sound D.A.P., 3	
				7·12106, sound, 5		
				7·12107, sound, 5		
				7·12109, sound, 3		
				7·121001, sound, 5		
				7·121002, sound, 3		
				7·121003, not examined—	7·1210032,sound, 4	
					7·1210033,sound, 3	
					7·1210034,sound, 3	
					7·1210035,sound, 6	
					7·1210036,sound, 5	
					7·1210031, sound D.A.P., 3	
				7·121004, sound, 3		
				7·121005, sound, 3		
				7·121007, sound, 3		
				7·12104, sound D.A.P , 4		
				7·12102, **sidebone**,3		
				7,12108, **sidebone**, 3		
				7·121006, **sidebone**, 5		
		7·13 not examined	7·131, not examined	7·1311, sound, 8—	7·13111, sound, 4	
					7·13112, sound, 3	
					7·13113, sound, 3	
					7·13114, sound, 3	
					7·13115, sound, 5	
				7·1312, not examined—	7·13121, sound 5	
					7·13122, sound, 3	
					7·13123, sound, 3	
					7·13124, sound, 3	
					7·13125, sound, 4	
					7·13126, sound, 3	
				7·1313, not examined—	—7·13131, sound, 4	7·131311, sound, 3
						7·131312, sound, 4
				7·1314, not examined—	—7·13141, sound, 4	

FAMILY 7—*continued.*

7	7·2, not examined	7·21, not examined	7·211, not examined	7·2111, sound, 5		
				7·2112, sound, 5		
			7·212, sound, 5	7·2121, sound, 7		
				7·2122, sound, 4		
				7·2123, sound, 3		
				7·2124, sound, 5		
				7·2125, sound, 4		
				7·2126, sound, 3		
				7·2127, sound, 3		
				7·2128, sound, 4		
				7·2129, sound, 3		
				7·21201, sound, 6		
		7·22, no examined	7·221, sound, 5	7·2211, sound, 5	7·22112, sound, 5	
					7·22113, sound, 3	
					7·22111, sound D.A.P.	
				7·2212, sound, 4		
				7·2214, sound, 5		
				7·2217, sound, 3		
				7·2218, not examined	7·22181, sound D.A.P., 3	
				7·22101, sound, 5		
				7·22102, sound, 5		
				7·22103, sound, 5		
				7·22104, sound, 5		
				7·22105, sound, 3		
				7·221001, sound, 3		
				7·2213, sound D.A.P., 5		
				7·22106, sound D.A.P., 3		
				7·22108, sound D.A.P. 3		
				7·22109, sound D.A.P., 4		
				7·2215, **sidebone**, 4		
				7·2216, **sidebone**, 4		
				7·2219, **sidebone**, 4		
				7·22107, **sidebone**, 5		
		7·23, not examined	7·231, not examined	7·2311, not examined	7·23113, sound, 3	
					7·23114, sound, 3	
					7·23115, sound, 3	7·231151, sound, 5
						7·231152, sound D.A.P., 5
					7·23116, sound, 3	
					7·23117, sound, 3	
					7·231101, sound, 3	
					7·231102, sound, 4	7·2311022, sound, 4
						7·2311021, sound D.A.P., 5
					7·231106, sound, 3	
					7·231107, sound, 4	7·2311071, sound, 4
					7·231108, sound, 3	
					7·231109, sound, 4	
					7·2311001, sound 5	7·23110011 sound D.A.P. 3
					7·2311002, sound, 5	
					7·2311003, not examined	7·23110031 sound, 3
					7·2311004, sound, 3	
					7·2311005, sound, 4	
					7·23111, **sidebone**, 3	
					7·23112, **sidebone**, 3	7·231121, **sidebone**, 3
					7·23118, **sidebone**, 4	
					7·23119, **sidebone**, 3	
					7·231103, **sidebone**, 4	
					7·231104, **sidebone**, 5	
					7·231105, **sidebone**, 5	

FAMILY 7—*continued.*

7	7.2, not examined —*continued*.	7.23, not examined —*continued*.	7.231, not examined —*continued*.	7·2312, not examined—	7·23121, not examined—	7·231211, sound, 9	
						7·231212, sound, 5	
						7·231213, sound, 4	
						7·231214, sound, 5	
						7·231216, sound D.A.P., 5	
						7·231215, **sidebone**, 4	
					7·23122, not examined	—7·231221, sound D.A.P., 4	
					7·23123, not examined	—7·231231, **sidebone**, 4	
				7·2313, **ringbone**, 14			
				7·2314, **sidebone**, 10	—7·23141, sound, 6		
				7·2316, sound, 7			
				7·2315, not examined—	7·23151, sound, 5		
					7·23153, sound, a	7·231532, sound, 3	
						7·231533, not examined—	—7·2315331, sound D.A.P., 3
						7·231535, sound, 5	
						7·231531, bog spavin, 4	
						7·231534, **sidebone**, 5	
					7·23154, sound, 7		
					7·23155, not examined—	7·231552, sound, 4	
						7·231553, sound D.A.P., 3	
						7·231551, **sidebone**, 3	
					7·23156, not examined—	7·231561, sound, 3	
						7·231562, **sidebone**, 5	
					7·23157, sound, 5	—7·231571, sound D.A.P., 3	
					7·23152, **ringbone**, 3	7·231522, sound, 7	
						7·231524, sound, 3	
						7·231526, sound, 3	
						7·231521, sound D.A.P., 5	
						7·231523, sound D.A.P., 5	
						7·231525, sound D.A.P.	
				7·2317, not examined—	7·23171, not examined—	7·231711, sound, 3	
						7·231712, sound, 3	
					7·23172, sound, 6		
					7·23173, sound, 6		
					7·23174, sound, a	7·231741, sound, 3	7·2317412, sound, 3
							7·2317413, sound, 3
							7·2317414, sound, 4
							7·2317411, sound, D.A.P., 4
						7·231742, sound, 3	
						7·231744, sound, 3	
						7·231746, sound, 3	
						7·231745, sound D.A.P.	
						7·231743, **sidebone**, 3	
					7·23175, sound, 3		
					7·23176, sound, 3		
				7·2318, not examined—	—7·23181, sound, a—	—7·231811, sound, 5	
				7·2319, not examined—	—7·23191, sound, a		
				7·23101, not examined—	—7·231011, sound, 10		
				7·23102, not examined—	—7·231021, sound, 5		
				7·23103, not examined—	7·231031, **sidebone, ringbone**, 5		
					7·231032, **sidebone**, 4		
			7·232, not examined	7·2321, **sidebone**, 8			
				7·2322, **sidebone, ringbone**, a			

FAMILY 7—*continued.*

7	7·2, not examined —*continued.*	7·24, **sidebone**, a—	7·241, sound, 3 —	—7·2411, sound, 5		
			7·242, sound, 3 —	—7·2421, **ringbone**, 7		
			7·243, sound, 3			
			7·244, sound, 3			
			7·245, sound, 3			
			7·246, sound, 3			
			7·247, sound, 2			
			7·248, sound, 5			
			7·2401, sound, 5			
			7·249, **ringbone**, 4			
		7·25, sound, a	7·251, sound, 5			
			7·252, sound, 5			
			7·253, sound, 5			
			7·256, sound, 5			
			7·257, sound, 5 —	—7·2571, sound, 3		
			7·258, sound, 5			
			7·2502, sound, 5			
			7·2504, sound, 4			
			7·2505, sound, 4 —	7·25051, sound D.A.P., 3		
				7·25052, sound D.A.P., 3		
			7·2507, sound, 5			
			7·2508, sound, 5			
			7·2509, sound, 4			
			7·25001, sound, 5	7·250011, souud, 5		
				7·250012, sound, 7		
				7·250013, sound, 3		
				7·250014, sound D.A.P., 3		
			7·25002, sound, 3			
			7·25003, sound, 3			
			7·25004, sound, 3	—7·250041, sound D.A.P., 3		
			7·255, sound D.A.P., 3			
			7·259, sound D.A.P., 4			
			7·2501, sound D.A.P., 2			
			7·2503, sound, D.A.P.			
			7·2506, sound, D.A.P., 3			
			7·254, **sidebone**, 5			
		7·26, not examined	7·261, sound, 6			
			7·264, sound, 4			
			7·265, sound, 5			
			7·263, sound D.A.P., 3			
			7·262, bog spavin. 3			
	7·3 not examined	7·31 not examined	—7·311 not examined	—7·3111 not examined	—7·31111, sound, 5	7·311111, sound, 5
						7·311113, sound, 4
						7·311114, sound, 4
						7·311115, sound, 4
						7·311112, sound D.A.P., 4
						7·311116, sound D.A.P., 3
				7·3112, not examined —	7·31122, sound, 5	
					7·31121, sound, 7	—7·311211, sound, 4
					7·31123, sound, 4	
					7·31125, sound, 5	
					7·31126, sound, 5	
					7·31128, sound, 3	
					7·311201, sound, 3	
					7·31124, **sidebone**, 3	
					7·31127, **sidebone**, 4	
					7·31129, **sidebone**, 5	
				7·3113, not examined—	7·31131, not examined—	7·311311, sound, 5
						7·311312, sound, 3
						7·311313, sound, 3
						7·311314, sound, 3
						7·311315, sound, 3
						7·311316, sound, 2
						7·311317, sound, 5
						7·311318, sound, 3

FAMILY 7—*continued.*

- 7
  - 7.3 not examined—*continued.*
    - 7.31 not examined—*continued.*
      - 7.311 not examined—*continued.*
        - 7.3113 not examined—*continued.*
          - 7.31131 not examined—*continued.*
            - 7·3113101, sound — 7.31131011, **sidebone, 4**
            - 7·3113102, sound, 3
            - 7·3113103, sound, 3
            - 7·3113104, sound, 5
            - 7·3113105, sound, 3
            - 7·3113106, sound, 3
            - 7·3113107, sound, 5
            - 7·3113108, sound, 3
            - 7·3113109, sound, 4
            - 7·31131001, sound, 3
            - 7·31131002, sound, 5
            - 7·31131003, sound, 3
            - 7·31131004, sound, 3
            - 7·31131005, sound, 5
            - 7·31131006, sound, 3
            - 7·31131007, sound, 3
            - 7·311319, **sidebone, 4**
          - 7·31132, not examined—
            - 7·311321, sound, 3
            - 7·311322, sound, 3
            - 7·311323, sound, 3
            - 7·311324, sound, 3
            - 7·311325, sound, 3
            - 7·311326, sound, 3
            - 7·311328, sound, 3
            - 7·311327, spavin, 4
        - 7·3114, not examined
          - 7·31141, not examined—
            - 7·311411, sound, 5 —
              - 7·3114111, sound, 5
              - 7·3114112, sound, 4
            - 7·311412, not examined
              - 7·3114121, sound, 3
              - 7·3114122, sound, 3
              - 7·3114124, sound, 3
              - 7·3114125, sound, 3
              - 7·3114126, sound, 5
              - 7·3114127, sound, 3
              - 7·3114128, sound, 3
              - 7·3114129, sound, 4
              - 7·31141201, sound, 3
              - 7·31141203, sound, 3
              - 7·31141204, sound, 3
              - 7·3114123, sound D.A.P., 3
              - 7·31141232, sound D.A.P., 4
        - 7·3115, not examined
          - 7·31151, not examined—
            - 7·311511, sound, 4
            - 7·311512, sound, 4
            - 7·311513, sound, 5 —
              - 7·3115131, sound, 3
              - 7·3115132, sound D.A.P., 3
              - 7·3115133, sound D.A.P., 3
            - 7·311514, sound, 5 — 7·3115141, sound, 3
            - 7·311515, sound, 3
        - 7·3116, not examined
          - 7·31161, not examined—
            - 7·311611, sound, 5
            - 7·311612, sound, 5
            - 7·311613, sound, 4
            - 7·311614, sound, 6 — 7·3116141, sound, 3
            - 7·311615, sound, 3
            - 7·311616, sound, 3
            - 7·311617, sound, 3
            - 7·311618, sound, 5 —
              - 7·3116181, sound, 3
              - 7·3116183, sound, 4
              - 7·3116187, sound, 4
              - 7·3116188, sound, 2
              - 7·3116189, sound, 2
              - 7·3116184, sound D.A.P., 3
              - 7·3116186, sound D.A.P., 3
              - 7·3116182, **sidebone, 3**
              - 7·3116185, **sidebone, 4**
              - 7·31161801, **sidebone, 5**
            - 7·311619, sound, 5
            - 7·3116101, sound, 3
            - 7·3116102, sound D.A.P., 5
            - 7·3116103, sound, 5 —
              - 7·31161031, sound, 4
              - 7·31161035, sound, 3
              - 7·31161033, sound, 3
              - 7·31161034, sound, 4
              - 7·31161032, **sidebone, 3**
            - 7·3116104, sound, 3
            - 7·3116105, sound, 3

FAMILY 7—*continued.*

7	7·3 not examined —*continued.*	7·31, not examined —*continued.*	7·311, not examined —*continued.*	7·3116 not examined —*continued.*	7·31161, not examined —*continued.*	7·3116106, sound, 3	
						7·3116107, sound, 5	
						7·3116108, sound, 3	
						7·3116109, sound, 5	
						7·31161001, sound, 2	
						7·31161002, sound, 3	
						7·31161003, not examined	—7·311610031, sound D.A.P., 3
						7·31161004, sound, 5	
						7·31161005, sound, 3	
						7·31161006, sound, 5	
						7·31161007 sound, 3	
						7·31161008, sound, 3	
						7·31161009, sound, 4	
						7·311610002, sound, 3	
						7·311610003, sound, 3	
						7·311610006, not examined	—·31176100061, sound, 5
						7·311610007, sound, 3	
						7·311610008, sound, 5	
						7·311610009, sound, 3	
						7·3116100001, sound, 5	
						7·3116100002, sound, 3	
						7·3116100003, sound, 3	
						7·3116100004, sound, 5	
						7·3116100005, sound, 3	
						7·3116100006, sound, 3	
						7·3116100007, sound, 3	
						7·3116100008, sound, 5	
						7·31161000001, sound, 3	
						7·31161000002, sound, 3	
						7·31161000003, sound, 3	
						7·31161000004, sound, 3	
						7·311610001, **sidebone**, 4	
						7·311610004, **sidebone**, 5	
						7·311610005, **sidebone**, 7	
						7·3116100009, sound D.A.P., 5	
					7·31162, souud, 13 —	—7·311621, sound, 5	
					7·31163, sound, 5		
				7·3117, not exd.	7·31171, sound, 3		
					7·31172, sound, 3		
					7·31173, sound, 3		
					7·31174, sound, 4		
					7·31175, sound, 5		
					7·31176, sound, 5 —	—7·311761, sound D.A.P., 3	
					7·31177, sound, 3		
					7·31178, sound, 3		
					7·31179, sound, 5		
					7·311701, sound, 3		
					7·311702, sound, 2		
					7·311703, sound, 5		
					7·311705, sound, 4		
					7·311706, sound, 3		
					7·311707, sound, 5		
					7·311708, sound, 4		
					7·311709, sound, 5		
					7·3117002, sound, 3		
					7·3117003, sound, 4		
					7·3117004, not examined—	7·31170041, sound, 3	
						7·31170042, sound, 3	
					7·3117005, sound, 6		
					7·3117006, sound, 3		
					7·3117007, sound, 3		
					7·3117008, sound, 5		
					7·3117009, sound, 5		
					7·31170001, sound, 3		
					7·31170002, sound, 4		
					7·31170003, sound, 2		
					7·31170004, sound, 4		
					7·31170005, sound, 2		
					7·31170006, sound, 4		
					7·31170007, sound, 3		
					7·31170008, sound, 3		
					7·31170009, sound, 3		
					7·311700001, sound, 3		
					7·311700002, sound, 3		
					7·311700003, sound, 3		
					7·311700004, sound, 3		
					7·311700005, not examined—	—7·3117000051 sound, 3	
					7·311704, **sidebone**, 5		
					7·3117001, **sidebone**, 4		

FAMILY 7—*continued.*

7	7·3 not examined —*continued.*	7·31 not examined —*continued.*	7·311 not examined—*continued.*	7·3118, not examined	7·31181, not examined—	7·311811, spavin, 3
						7·311812, **ringbone**, 4
				7·3119, not examined—	7·31191, not examined—	7·311911, sound, 4
						7·311912, sound, 6
						7·311913, sound, 3
						7·311914, sound, 5
						7·311915, sound, 4
						7·311916, sound, 3
						7·311917, sound, 3
						7·311918, sound, 3
						7·311919, sound, 5
					7·31192, not examined—	7·311921, sound, 5
						7·311922, spavin, 5
				7·31101, not examined—	7·311011, sound, 5 —	7·3110111, sound D.A.P., 5
						7·3110112, **sidebone**, 3
					7·311012, sound, 5	
					7·311013, sound, 6	
					7·311014, sound, 3	
					7·311015, sound, 3	
					7·311016, sound, 5 —	7·3110161, **sidebone**, 3
					7·311017, sound, 3 —	7.3110171, sound, 3
					7·311018, sound, 4	
					7·311019, sound, 3	
					7·3110101, sound, 3	
					7·3110102, sound, 4	
					7·3110103, sound, 4	
					7·3110104, sound, 5	
					7·3110105, sound, 7	
					7·3110106, sound, 3	
					7·3110107, sound, 4	
					7·3110108, sound, 5	
					7·3110109, sound, 5	
					7·31101001, sound, 5	
					7·31101002, sound, 3	
					7·31101003, sound, 5	7·311010031, sound, 5
						7·311010032, sound, 3
						7·311010033, sound, 3
						7·311010034, sound D.A.P., 5
						7·311010035, **sidebone**, 3
					7·31101004, sound, 3	
					7·31101005, sound, 5	
					7·31101006, sound, 5	—7·311010061, sound, 4
					7·31101007, sound 5	
					7·31101008, sound, 3	
					7·31101009, sound, 6	
				7·31102, not examined—	7·311021, sound, 4	
					7·311023, sound, 3	
					7·311025, sound, 3	
					7·311028, sound, 4	
					7·311029, sound, 3	
					7·3110201, sound, 4	
					7·3110202, sound, 3	
					7·3110203, sound, 3	
					7·311022, **sidebone**, 5	
					7·311026, **sidebone**, 3	
					7·3110204, **sidebone**, 5	
					7·311024, **ringbone**, 4	
				7·31103, not examined	—7·311031, not examined—	7·3110311, sound, 4
						7·3110312, sound, 3
						7·3110314, sound, 3
						7·3110315, sound, 4
						7·3110316, sound, 3
						7·3110317, sound, 4
						7·3110318, sound, 3
						7·3110319, sound, 3
						7·31103101, sound, 3
						7·3110313, **sidebone**, 3
				7·31104, not examined—	7·311041, sound, 3	
					7·311042, sound, 3	
					7·311044, sound, 3	
					7·311045, sound, 4	
					7·311046, sound, 5 —	7·3110461, sound, 4
						7·3110462, sound, 4
					7·311047, sound, 5	
					7·311048, sound, 4	
					7·311049, sound, 4	
					7·3110401, sound, 3	
					7·3110402, sound, 4	
					7·3110403, sound, 3	
					7·3110404, sound, 3	
					7·3110405, sound, 4	

FAMILY 7—*continued.*

7	7.3 not examined—*continued.*	7.31 not examined—*continued.*	7.311 not examined—*continued.*	7·31104, not examined—*continued.*	7·3110406, sound, 3		
					7·3110407, sound, 3		
					7·3110409, sound, 3		
					7·31104001, sound, 5		
					7·31104002, sound, 5		
					7·31104003, sound, 6		
					7·31104004, sound, 3		
					7·31104006, sound, 5		
					7·31104008, sound, 4		
					7·31104009, sound, 5		
					7·311040001, sound, 5		
					7·311040002, sound, 3		
					7·311040003, sound, 5		
					7·311040004, sound, 3		
					7·311040005, sound, 4		
					7·311040006, sound, 4		
					7·311040007, sound, 3		
					7·311040008, sound, 3		
					7·311040009, sound, 5		
					7·3110400001, sound, 3		
					7·3110400002, sound, 3		
					7·3110400003, sound, 3		
					7·3110400004, sound, 3		
					7·3110400005, sound, 3		
					7·31104007, sound D.A.P., 5		
					7·3110408, **sidebone**, 4		
					7·311043, **ringbone**, 3		
					7·31104005, **ringbone**, 5		
				7·31105, not examined	7·311051, not examined	7·3110511, sound, 6	
					7·311052, sound, 4	7·3110521, sound, 5	
						7·3110522, sound, 4	
						7·3110523, sound, 3	
						7·3110524, sound, 3	
						7·3110525, sound, 3	
					7·311053, not examined	7·3110531, not examined	7.31105311, sound, 3
					7·311054, sound, 4		
					7·311055, not examined	7·3110551, roarer, 7	
				7·31106, not examined	7·311061, not examined	7·3110611 sound, 3	
					7·311062, not examined	7·3110627, sound, 3	
				7·31107, not examined	7·311071, not examined	7·3110711, sound, 4	
						7·3110712, sound, 3	
				7·31108, not examined	7·311081, not examined	7·3110811, sound, 3	
				7·31109, not examined	7·311091, sound, 5		
					7·311092, sound, 3		
					7·311093, sound, 4		
					7·311094, sound, 2		
					7·311097, sound, 3		
					7·311098, sound, 3		
					7·311099, sound, 4		
					7·3110901, sound, 4		
					7·3110902, sound, 3		
					7·3110903, sound, 5		
					7·3110904, sound, 3		
					7·3110905, sound, 3		
					7·3110906, sound, 3		
					7·3110908, sound, 3		
					7·3110909, sound, 3		
					7·311096, sound D.A.P., 6		
					7·311095, **ringbone**, 3		
					7·3110907, spavin, 4		
				7·311001, not examined	7·3110011, sound, 6	7·31100111, sound D.A.P., 4	
				7·311002, not examined	7·3110021, not examined	7·31100212, sound, 3	
						7·31100213, sound, 3	
						7·31100214, sound, 3	
						7·31100215, sound, 3	
						7·31100211, **ringbone**, 9	**7.311002111, sound, [illegible]**
				7·311003, not examined	7·3110031, not examined	7·31100311, sound, 3	

FAMILY 7—*continued.*

7	7.3 not examined *continued*	ex-7.31 not—examined.—*continued*	7.311 not examined—*continued.*	7·311004, not examined	7·3110041, sound, 5	
					7·3110042, sound, 5	
					7·3110043, sound 5—	7·31100431, sound, 3
						7·31100432, sound, 4
					7·3110044, sound, 5	
					7·3110045, sound, 5	
					7·3110046, sound, 7—	7·31100462, sound, 3
						7·31100463, sound, 3
						7·31100464, sound, 5
						7·31100465, sound, 3
						7·31100466, sound, 5
						7·31100461, **sidebone,** 5
						7·31100467, **sidebone,** 5
					7·3110047, sound, 5	
					7·3110048, sound, 5	
					7·3110049, sound, 5	
					7·31100401, sound, 5	
					7·31100402, sound, 3	
					7·31100403, sound, 5	
					7·31100405, sound, 5	—7·311004051, sound, 4
					7·31100406, sound, 5	
					7·31100407, sound, 5	7·311004072, sound D.A.P., 5
						7·311004073, sound, 3
						7·311004074, sound, 3
						7·311004071, sound 4 D.A.P.,
					7·31100408, sound, 3	
					7·311004001, sound, 3	
					7·311004002, sound, 5	
					7·311004004, sound, 4	
					7·311004005, sound, 4	
					7·31100409, sound, 5—	7·311004091, sound, 6
						7·311004092, sound, 3
					7·311004006, sound, 4	
					7·311004007, sound, 4	
					7·311004009, sound, 3	
					7·3110040001, sound, 4	
					7·3110040002, sound, 3	
					7·3110040003, sound, 5	
					7.31100404, **ringbone,** 4	
					7·311004003, **ringbone,** 4	
					7·311004005, **sidebone,** 5	
					7·311004008, **sidebone,** 5	
				7·311005, not examined –	7·3110051, sound, 3	
					7·3110052, sound, 3	
				7·311006, not examined—	7·3110062, sound, 5	
					7·3110063, sound, 5	
					7·3110061, shiverer, 4	
				7·311007, not examined—	—7·3110071, sound, 5	
				7·311008, not examined—	7·3110081, not examined—	7·31100812, sound, 3
						7·31100813, sound, 5
						7·31100814, sound, 3
						7·31100815, sound, 5
						7·31100816, sound, 5
						7·31100817, sound, 3
						7·31100819, sound, 3
						7·311008101, sound, 5
						7·311008103, sound, 3
						7·311008104, sound, 3
						7·311008105, sound, 3
						7·311008106, sound, 3
						7·31100811, **sidebone,** 5
						7·311008102, **sidebone,** 5
						7·31100818, **ringbone,** 5
					7·3110082, sound, 3	
				7·311009, not examined—	7·3110091, not examined—	7·31100911, sound, 3
						7·31100912, sound, 3
						7·31100913, sound, 3
						7·31100914, sound, 3
					7·3110092, sound, 4 —	7·31100921, sound, 5
						7·31100922, sound, 3

FAMILY 7—*continued.*

7	7.3 not examined—*continued.*	7.31 not examined—*continued.*	7.311 not examined—*continued.*	7.311009, not examined—*continued.*	7·3110093, sound, 3		
					7·3110094, not examined—	7·31100941, sound, 5	
						7·31100943, sound, 4	
						7·31100944, sound, 5	
						7·31100946, sound, 3	
						7·31100947, sound, 3	
						7·31100942, sound D.A.P., 5	
						7·31100948, sound D.A.P., 4	
						7·31100949, sound D.A.P., 3	
						7·31100945, **sidebone,** 6	
					7·3110095, sound, 5 —	7·31100951, sound, 5	
						7·31100952, sound, 3	
						7·31100953, sound, 4	
						7·31100955, sound, 5	
						7·31100956, sound, 3	
						7·31100957, sound, 3	
						7·31100958, sound, 5	
						7·31100959, sound, 3	
						7·31100954, sound D.A.P., 3	
					7.3110096, sound, 3		
					7.3110097, sound, 5		
					7·3110098, not examined—	—7·31100981, sound, 4	
					7·31100901, sound, 3		
					7·31100902, sound, 3		
					7·31100903, sound, 3		
					7·31100904, sound, 3		
					7·31100905, sound, 3 —	7·311009051, sound D.A.P., 5	
						7·311009052, sound D.A.P., 4	
					7·31100906, sound, 2		
					7·31100907, sound, 4		
					7·31100908, not examined—	—7·311009081, sound, 4	
					7·3110099, **ringbone,** 3		
					7·31100909, **sidebone,** 5		
				7·3110001, not exd.—	7·31100011, not examined—	—7·311000111, sound, 5	
					7·31100012, sound, 7		
					7·31100013, sound, 4		
					7·31100014, sound, 5—	7·311000141, sound D.A.P.	
						7·311000142, **sidebone**	
						7·311000143, **sidebone** 6	—7.311000143 1, sound, 4
					7·31100015, not examined—	—7·311000151, sound, 6	
					7·31100016, not examined—	—7·311000161, sound, 4	
				7·3110002, not exd.—	7·31100021, sound, 3		
					7·31100022, sound, 3		
			7·312, not examined	7·3121, not exd.—	7·31211, sound, 5		
					7·31212, sound D.A.P., 6		
					7·31213, sound, 3		
					7·31214, sound, 4		
					7·31215, sound, 4		
					7·31216, sound, 5		
					7·31217, sound, 3		
					7·31218, sound, 3		
					7·31219, sound, 5		
					7·312101, sound, 3		
					7·312102, sound, 6		
					7·312103, sound, 3		
					7·312104, sound, 3		
					7·312105, sound, 3		
					7·312106, sound, 3		
					7·312107, sound, 3		
			7·313, not examined—	7·3131, not exd.—	—7·31311, sound		
				7·3132, not exd.—	—7·31321, sound, 3		
				7·3133, not exd.—	7·31333, sound, 3		
					7·31334, sound, 4		
					7·31335, sound, 3		
					7·31336, sound, 3		
					7·31337, sound, 5		

FAMILY 7—*continued.*

7	7·3 not examined—*continued.*	7·31 not examined—*continued.*	7·313 not examined—*continued.*	7·3133, not examined—*continued.*	7·31339, sound, 4	
					7·313301, sound 5	
					7·313302, sound, 5	
					7·313303, sound, 5	
					7·31338, sound D.A.P., 3	
					7·31331, **sidebone,** 7	
					7·31332, **sidebone,** 4	
			7·314, not examined—	7·3141, sound, 4—	7·31411, sound, 4	
					7·31412, sound, 3	
				7·3142, sound, 4		
			7·315, not examined	7·3151, not examined—	7·31512, sound, 5	
					7·31511, **ringbone,** 6	
			7·316, not examined—	7·3161, sound, 3		
		7·32, not examined	7·321, not examined—	7·3211, **sidebone,** 14	7·32111, sound, 4	
					7·32112, sound, 5	
					7·32113, sidebone, 5	
		7·33, not examined	7·331, not examined	7·3311, not examined—	7·33112, sound, 3	
					7·33113, sound, 3—	7·331132, sound, 3
						7·331136, sound, 4
						7·331131, sound D.A.P., 4
						7·331134, sound D.A.P., 4
						7·331135, sound D.A.P., 3
						7·331137, sound D.A.P., 3
						7·331133, **sidebone,** 3
					7·33115, sound, 4	
					7·33116, sound, 3	
					7·33111, sound D.A.P., 3	
					7·33114, sound D.A.P., 3	
					7·33117, **sidebone,** 3	
			7·332, not examined—	7·3321, **sidebone,** a	7·33211, sound, 7 —	7·332111, sound, 3
		7·34, not examined	7·341, **ringbone,** 8			
			7·342, bog spavin, a—	7·3421, sound, 3		
			7.343, sound 15			
		7·35, not examined	7·351, sound, a—	7·3512, sound, 4		
				7·3511, sound D.A.P., 5		
		7·36, not examined	7·361, not examined—	7·3611, not examined—	7·36111, sound, 3 —	7·361111, sound, 5
					7·36112, sound, 5	
				7·3612, not examined—	7·36121, sound, 3	
					7·36122, sound, 3	
					7·36123, sound, 3	
			7·362, not examined	7·3621, not examiued—	7·36214, sound, 3	
					7·36213, sound, 4	
					7·36212, sound, 3	
					7·36211, sound, 3	
	7·4, **not** examined	7·41, not examined—	7·411, not examined—	7·4111, sound, 8—	7·41111, **sidebone,** 4	
			7·412, sound a			
			7·414, sound, a—	7·4141, sound, 4		
				7·4142, sound 6	7·41421, sound, 3	
					7·41422, sound, 5	
					7·41424, sound, 4	
					7·41423, sound D.A.P., 3	
				7·4145, sound, 4		
				7·4146, sound, a	7·41461, sound, 5	
					7·41462, sound, 4	
					7·41463, sound, 5	
					7·41465, sound, 4	
					7·41464, spavin, 3	
				7·4148, sound, 5		
				7·4149, sound, 4		
				7·41401, not examined—	7·414011, sound, 3	
				7·4143, sound D.A.P., 5		
				7·4144, **sidebone**		
				7·4147, **sidebone,**—	7·41471, sound, 3	

Family 7—*continued.*

7	7.4 not examined—*continued.*	7.41 not examined—*continued.*	7·415, not examined—	7·4151, sound, 5			
				7·4152, sound, 3			
				7·4153, **sidebone**, 6			
			7·416, not examined—	7·4161, not examined—	—7·41611, **sidebone**, 4		
				7·4162, not examined—	—7·41621, sound, 3		
				7·4165, not examined—	7·41651, sound, 3		
					7·41652, sound, 4		
					7·41653, sound, 3		
				7·4163, **sidebone**, a			
				7·4164, **sidebone**, a-	—7·41641, **sidebone**, 5		
			7·417, sound, a				
			7·418, sound, a—	7·4181, sound, 5			
				7·4182, sound D.A.P., 7			
			7·419, sound, a				
			7·4102, not examined—	—7·41021, sound, 5			
			7·413, **sidebone**	7·4131, sound, 3			
				7·4132, sound, 8			
			7·4101, **sidebone**, a—	7·41012, sound, 5			
				7·41014, sound, 4			
				7·41011, **ringbone**, 5			
				7·41013, bog spavin, 2			
		7·42, not examined—	7·421, **sidebone**, 5				
			7·422, **sidebone**, 3				
			7·423, **sidebone**, a				
		7·43, not examined	—7·431, not examined	—7·4311, **sidebone**, 6			
		7·44, not examined—	7·441, sound, 6				
			7·442, spavin, 5				
		7·45, not examined—	7·451, sound, a—	7·4512, sound, 5			
				7·4511, sound, 4			
			7·452, not examined	7·4521, sound, 5			
				7·4522, sound, 3 —	7·45221, sound, 3		
					7·45223, sound, 6		
					7·45222, sound D.A.P., 5		
			7·453, not examined—	—7·4531, sound, 5			
		7·46, not examined—	7·462, sound D.A.P., a				
			7·461, **sidebone**, 7				
		7·47, not examined	—7·471, sound, a	—7·4711, sound, 5			
		7·48, not examined	—7·481, sound, 4				
		7·49, not examined—	7·491, not examined—	7·4911, sound, 4			
				7·4913, not examined—	—7·49131, sound, 5		
				7·4914, sound, a —	—7·49141, sound, 4		
				7·4916, not examined—	—7·49161, sound, 8		
				7·4912, **sidebone**, a			
				7·4915, **sidebone**, 7			
			7·492, not examined	7·4921, not examined	—7·49211, sound D.A.P., 3		
				7·4922, not examined—	7·49221, sound, 3—	7·492211, sound, 4	
						7·492212, sound, 3	
						7·492213, sound, 3	
					7·49222, sound, 6		
					7·49223, not examined	—7·492231, sound, 4	
				7·4923, not examined—	7·49231, not examined	—7·492311, sound, 3	7·4923111, sound, 3
					7·49232, **sidebone**, a—	—7·492321, sound, 8	
					7·49233, roarer		
				7·4924, not examined—	7·49241, sound, 5		
					7·49242, sound, 5		
				7.4925, sound 10—	—7.49251, sound, 3		

FAMILY 7—*continued.*

7	7·5, not examined	7·51, sound, 4 7·52, sound, 4 7·53, **ringbone**				
	7·6, not examined	7·61, not examined	–7·611, sound, 4			
	7·7, not examined	7·71, not examined	7·711, sound 5 7·712, **side-bone**, a	—7·7111, sound D.A.P., 4		

THE WEEVIL PEST OF GRAIN.

Summary of Proceedings of Conference held in Melbourne, October 15th, 1918.

The following were present:—

Professor D. ORME MASSON, F.R.S., Deputy Chairman of the Commonwealth Advisory Council of Science and Industry, in the chair;

Mr. LOVE, British Wheat Commissioner;

Representatives of the Australian Wheat Board: Mr. H. G. D. DARLING, Mr. G. C. BOEHME, and Mr. H. A. PITT (Manager);

Representatives of the Advisory Council Grain Pests Committee: Mr. L. ROSSELL (Chairman), Mr. W. W. FROGGATT (Government Entomologist, New South Wales);

Representatives of the Victorian Wheat Board: Hon. D. S. OMAN, M.L.A. (Minister for Agriculture), Hon. W. KENDELL, M.L.C., Messrs. BAKER and SIBBALD;

Representatives of the Victorian Department of Agriculture: Dr. S. S. CAMERON, Mr. A. E. V. RICHARDSON, and Mr. C. FRENCH (Government Entomologist);

Representatives of South Australian Wheat Weevil Committee: Dr. W. A. HARGREAVES (Chairman), Mr. A. M. LEA (Government Entomologist), Mr. D. C. WINTERBOTTOM (Supervisor);

Dr. W. H. GREEN and Mr. W. B. ALEXANDER (Secretary).

The CHAIRMAN welcomed the delegates on behalf of Senator Russell, Chairman of the Advisory Council and of the Australian Wheat Board, who had summoned the Conference. He briefly outlined the position, pointing out that the Advisory Council, at the request of the Royal Society of London, received through the Commonwealth Government, had appointed a Special Committee to undertake researches. The Special Committee had outlined a scheme of investigation, and had suggested that the Australian Wheat Board should provide the necessary funds; but the Wheat Board had been unable to make a grant for this purpose. It was understood that the Wheat Weevil Committee

in South Australia had carried out important investigations, and the present Conference had been summoned to consider what further investigations were necessary, and by whom they should be carried out and financed, with a view to avoiding unnecessary duplication of effort. It appeared that the necessary work might be broadly divided into two:—Experiments on a large scale for the treatment of wheat already in store, such as were being conducted in South Australia; and more fundamental scientific researches on the life-history of grain pests and other matters bearing on the problem.

After discussion it was decided that the press should not be admitted to the Conference.

Mr. Rossell (Chairman of the Special Committee of the Advisory Council) outlined the researches that the Committee thought should be undertaken. He emphasized the necessity for the employment of research workers who would be able to give their whole time. A central committee to co-ordinate all work carried out in Australia would obviously be a great advantage.

Mr. Froggatt gave a review of the various pests which were damaging the wheat, and emphasized the seriousness of the position. He considered that the necessary researches would require the employment of a bio-chemist and entomologist.

Dr. Hargreaves stated that, about a year ago, the position in South Australia having become acute, the Government referred the matter to the Department of Chemistry, and a Wheat Weevil Committee had been appointed, of which he was chairman. The first experiments carried out were as to the possibility of poisoning by gases. Hydrocyanic acid, carbon bisulphide, carbon monoxide, and carbon dioxide had been tried, and of these carbon bisulphide was probably the most efficient poison gas, though it had later been found that weevil could be asphyxiated by the use of carbon dioxide. Treatment with lime as advocated by Mr. Barrett had also been tried, but was found inefficient. Storage in sand was satisfactory on a small scale, but not so good on a large scale. The heat treatment was then tried, and seemed promising. A machine was designed and constructed in the Department, and proved successful and economical. In connexion with the heat treatment, over 2,000 experiments had been undertaken to determine the rate of flow of wheat and the rate of heating in pipes of various temperatures. The conclusion had been reached that most heating machines work at too high an initial temperature, and that the pressure of steam is too great. The South Australian machine works at atmospheric pressure. It was realized, however, that heat treatment was not a solution of the whole difficulty, as it was impossible to treat all the affected wheat in time. Some experiments made by Mr. Spafford had then suggested another alternative. He had sealed up weevily wheat in bottles and found that the weevils died in a fortnight. In three bottles it was found that the weevils were alive, but this was traced to incomplete sealing. Variations in atmospheric pressure probably accounted for the fact that the weevils were able to live, as air would be forced into the bottles. After five days in a sealed tube the percentage of carbon dioxide was found to be 15 per cent., and this was sufficient to kill weevils. These experiments suggested the possibility of enclosing stacks with a covering of malthoid, making them as airtight as possible, and then pumping in carbon dioxide.

A detailed account of an experiment carried out at Birkenhead, South Australia, on a stack of 8,500 bags of very weevily wheat, was submitted. It was found possible to maintain an amount of from 10 per cent. to 15 per cent. of carbon dioxide continuously. Gas was generated by passing air over a bed of hot coke in a furnace, the object being to get as near as possible to a mixture containing 80 per cent. of nitrogen and 20 per cent. of carbon dioxide with no free oxygen. The purpose was to displace all the oxygen in the enclosure to render the oxygen contents too low a percentage to support life. The experiment was highly successful. No live weevils were found in any part of the stack, but millions of dead weevils were seen. It thus appears that weevils can be destroyed without handling the wheat. Though it is impossible to make the malthoid enclosure absolutely airtight, the continuous passing in of nitrogen and carbon dioxide makes up for this, and enables an asphyxiating atmosphere to be maintained.

As regards the future, Dr. Hargreaves stated that he would be pleased to co-operate with any bodies formed to undertake research in other States, and to supply them with all information as to his experiments. In reply to a question he stated that larvæ and pupæ, as well as adult weevils, were killed by the process, but it was too early to state whether the eggs were also destroyed. If not, it would be necessary to repeat the process a few weeks later, when the eggs had developed.

Mr. Lea pointed out that the experiments demonstrated two things: Covering the stacks with malthoid was an absolute preventive, since flying insects and mice could not penetrate it. Any insects already in the stack are destroyed by fumigation, and thus the safe storage of the wheat is assured.

Mr. Winterbottom emphasized the importance of the results achieved, and stated that the data obtained by the Department of Chemistry ought to be published. He had been giving his whole time to weevil work for the past fifteen months. It was important to adopt preventive measures for new wheat; this should begin on the farm. The danger arising from the mixing of a few bags of old wheat by farmers with the new season's crop should be strongly emphasized, and farmers required to deliver all their wheat in the one season, so that it could be kept separate. One of the main difficulties was that infection took place in country sheds. The grain on the floors of the sheds —where these were of earth—contained weevil. The pest sometimes appeared to be absent for a long while, and might break out after nine months. He thought research was required as to the reason for this—probably atmospheric conditions were responsible; 24 inches of earth had been removed from the floors of some sheds, and yet weevils were still emerging. Rats and mice carried grain containing weevils down to the bottom of their holes, and it was impractically impossible to remove weevil from those floors. Impervious floors of lime concrete should be adopted in all sheds as essential; the superstructure was comparatively easily cleaned. Gutters placed round stacks were very efficient weevil traps, but did not check the flying Rhizopertha. Old dunnage was another source of infection, but it was found that immersion in boiling water containing 1 per cent. of bluestone was fairly

satisfactory. Whitewashing curtains improved their resistance to flying beetles. He calculated that a 60,000-bag stack could be covered with malthoid, as explained by Dr. Hargreaves, at a cost of 2.8d. or 3d. per bag. This did not include the cost of the floor.

The CHAIRMAN mentioned that the results as to asphyxiating of weevils were in complete accord with those obtained by Professor Dendy in England.

Mr. BAKER, on behalf of the Victorian Wheat Board, stated that no independent researches had been carried out in Victoria which had been free from serious weevil infestation until this year. Machinery for heat treatment was now being obtained, but in the light of Dr. Hargreaves' work it would probably be better to proceed with malthoid coverings.

Mr. LOVE pointed out that much of the wheat at present stacked was so badly infested that it would be necessary to clean and recondition it, but he was hopeful that covering with malthoid would prevent further damage. He thought there was a possibility of the eggs lying dormant, and only developing when the stack was broken down. Another possibility was that enclosing stacks with malthoid might lead to a rise in temperature and the wheat becoming bin burnt.

Dr. HARGREAVES pointed out that the absence of oxygen would prevent this.

Mr. WINTERBOTTOM stated that a stack enclosed in April showed no such effect after six months.

Mr. BAKER pointed out that heating only took place when moisture got in through a leaky roof.

Mr. LOVE, continuing, asked whether the gas treatment destroyed rodents, and whether the purity of the gas could be maintained or whether some other deleterious gases might not be evolved.

Mr. OMAN, on behalf of Victoria, congratulated Dr. Hargreaves and his fellow workers on the success of their experiments. The greatest difficulty hitherto had been how to stop the ravages of the weevil until the wheat could be reconditioned; this difficulty appeared now to have been overcome.

Dr. HARGREAVES expressed his gratification. Carbon dioxide was not likely to damage the gluten, but might damage the germinating power of the wheat, though Barnes and Grove had found otherwise. So far as his experiments had gone at present, germination was not affected. He emphasized the necessity for the control of fumigation operations by a chemist. The carbon dioxide treatment killed rodents as well as insects, and many dead rats and mice had been found. The effect of heat was being investigated. There was a possibility that starch might be hydrolised at 150 deg., though so far no bad effects had been shown.

Mr. LOVE, Mr. PITT and Mr. ROSSELL added their congratulations on the results of the South Australian experiments.

Mr. ROSSELL thought the report from South Australia should be printed, and that the practical points arising from it should be sent to the Wheat Boards and made widely known amongst farmers. He detailed the methods now being adopted in New South Wales to stack wheat, which he regarded as fairly satisfactory. He mentioned that the question of moisture absorption was being investigated by Mr. Guthrie. He thought inquiries were necessary as to the reason why

freshly reaped wheat was unsuitable for milling, and as to the changes that took place when it became mature. He thought, also, that it was important to ascertain whether the heat treatment killed the grain, and, if so, how long it could be kept afterwards without deterioration.

Mr. LEA mentioned that though weevils required a fairly high percentage of moisture, Rhizopertha will breed in dry wheat.

The CHAIRMAN pointed out that all organic matter is hygroscopic, the amount of moisture absorbed depending on atmospheric conditions.

Several members confirmed the hygroscopic qualities of wheat from their own experience.

Mr. FROGGATT thought that eggs would not keep long without hatching, but that the larvæ would probably remain dormant for a long period.

Mr. LEA thought it possible that under adverse conditions eggs might also remain dormant for considerable periods.

Mr. FROGGATT said that in New South Wales distribution of old bags and dunnage into the country was the chief cause of infection. He recommended treatment with salt water on the sea-board.

Mr. FRENCH said that in Victoria trucks were the greatest source of infection.

Mr. WINTERBOTTOM mentioned that weevils could live nine days in sea water.

Mr. LEA said that they could survive five hours in methylated spirit.

The CHAIRMAN suggested that two sub-committees should be appointed to draw up plans regarding present methods of treatment and future research respectively, and report to-morrow.

Mr. PITT thought that the Conference could proceed at once. He thought that the work in South Australia should have financial assistance, either from the Wheat Board or from the Federal Government. As regards scientific research, he explained that the Wheat Board was purely a selling organization, and that though it could allocate funds for the immediate protection of the grain, it would be outside its functions to make a grant for research. This was rightly a question for the Commonwealth and State Governments. He moved—

> That this meeting expresses satisfaction with the steps taken by the South Australian Weevil Committee for the preservation of existing stacks of wheat, and is of opinion that its investigations should be continued; also that financial assistance for this purpose should be rendered by the Wheat Board or by the Commonwealth and State Parliaments.

Mr. ROSSELL seconded the resolution, which was carried unanimously.

Mr. PITT then suggested that the research work should be undertaken by the Advisory Council with funds from the Commonwealth Government, and, if possible, subsidies from State Governments.

Mr. LEA suggested that there was room for a Committee in each State.

Dr. HARGREAVES thought that the Committees in each State could be kept in touch with one another through the Advisory Council. He moved—

> That Committees to undertake further scientific research on grain pests be appointed in each of the four wheat-growing

States to report to the Advisory Council. The present Committee of the Advisory Council to be the Committee for the New South Wales and the South Australia Wheat Weevil Committee to continue for that State, new Committees being formed in Victoria and Western Australia.

Mr. Boehme seconded the resolution, which was carried unanimously.

The investigations recommended by the Special Committee of the Advisory Council were then considered. It was decided that the following work should be carried out in each of the States:—

1. Examination of samples of insect-damaged grain from all parts of the Commonwealth, with a view to the determination of the injurious insects present, their comparative prevalence in different localities, and the extent and nature of the damage done.
2. Observations and experiments on the life-history of the insects chiefly responsible for damage to stored grain and the conditions favorable to their active multiplication as regards temperature, moisture and aeration. This would be work mainly supplementary to investigations, the results of which have been published in England and India; but it is essential that it should be done in view of the differences in Australian conditions.
3. Estimation of the water-content of wheat in various conditions, including the estimation of the percentage of moisture present in the grain when first harvested in various parts of the Commonwealth.
4. Recording the changes in the water-content of bulk samples during the maturation and dormancy of the grain; co-ordination of these changes with atmospheric conditions.
5. Experiments on the degree and rate of absorption of water in bulk samples of wheat kept at regulated temperatures in atmospheres artificially charged with moisture. These experiments would be varied so as to test the hygroscsopic properties of the grain in various stages of maturation.

It was further decided that experiments on the effect of hermetically sealing wheat and its influence on vitality be left to the South Australian Committee, together with investigations as to the effect of heat treatment on the vitality of wheat and its keeping and milling properties.

Dr. Green referred to lime treatment, and also to Mr. Barrett's proposals for the construction of basin silos with tar paved floors.

Mr. Rossell suggested that the effect of lime be investigated further by the Victorian Committee when formed.

This was agreed to.

With regard to tar flooring, Mr. Rossell stated that wheat in contact with it acquired a taint which rendered it unfit for milling.

A proposal that a pamphlet should be published in simple terms on the life histories of weevils and other grain insects and methods of destroying them and preventing infection, and widely distributed to farmers, was carried unanimously.

After a vote of thanks to the chairman the proceedings terminated.

ORCHARD AND GARDEN NOTES.

The Orchard.

E. E. Pescott, F.L.S., Pomologist.

Spraying.

The spray pump should now be in thorough working order, so that the various spring sprayings may be carried out with as little interruption as possible. It is always wise to clean out the pump after each spraying, so that it will be ready for the next mixture. Putting a different spray in a pump barrel that has not been washed out, very often causes the formation of a sediment, which blocks the nozzle and interrupts the work.

During November it will be necessary to spray for codlin moth, peach aphis, pear slug, and various leaf-eating insects. In addition, black spot of the apple and pear, shot hole, and other fungus diseases must be kept in check. As various sprays are required for all of these troubles, the necessity of always having a clean pump is evident.

At the present time the best spray for peach aphis is strong tobacco solution, and the same spray may also be used for the pear slug. Arsenate of lead is the better spray for this latter insect, but it should not be used when the fruit is approaching the ripening stage; hellebore may also be used for the slug with good effect.

As a preventive against codlin moth, the trees should be kept well sprayed with arsenate of lead. The first spraying should have been given at the time of the falling of the petals; the second spraying, owing to the rapid expansion of the fruit, should be given a fortnight later. After that the grower must use his own judgment as to the necessity for subsequent sprayings. If the moths be at all prevalent, other sprayings will be quickly necessary.

As the woolly aphis is increasing at this time of the year, it will mean a saving of a large number of buds if this insect be sprayed. Nicotine solution, pine spray, or lime sulphur may be used with good effect.

Cultivation.

The work of ploughing and harrowing should be completed immediately. All crops for green manure should be now under cover, and if the orchard soil is at all heavy or stiff, the grower should make up his mind to grow a crop next season, in order that this condition may be reduced.

The orchard should be kept free from weeds, not only for the conservation of moisture, but in order to do away with all hiding places of the Rutherglen fly, cutworm moths, &c.

General Work.

Grafted and newly-planted trees should be frequently examined, and given an occasional watering and overhead spraying, in order to encourage their growth, and to prevent loss of moisture from the foliage.

It is also advisable to mulch young trees with light grass, or straw mulching not too rich in animal manure.

The disbudding of unnecessary shoots and the pinching back or stopping of growths, to prevent their becoming unduly long, may now be carried out. This work is particularly important on young trees.

Graft ties should be examined, and the ties cut wherever any growth is being made. Where the grafts are likely to make any long growth, they should be well staked and tied.

Citrus trees may be planted out, and, after planting, they should be watered and mulched.

Vegetable Garden.

Tomato plants should now receive attention every day; laterals will require pinching back; crowded bunches and shoots should be thinned; the plants should be well tied to the stakes, and liberal supplies of water and manure should be given. One or two more plantings of tomato plants may still be made, so that there may be strong, sturdy plants for the production of late fruits. By planting three or four successions of plants, it is possible to have a good supply of fruits from December to June.

Celery may now be sown for winter crops. French beans should be largely sown. Cucumber, melon, pumpkin, and all seeds of this family may now be sown in the open.

Where these plants are already growing, the longest and strongest runners may be pinched back, to throw the strength into flowering and lateral growths. Watch the plants for mildew, and use sulphur freely wherever present, especially on the young plants.

Peas, lettuce, radish, turnip, cabbage, and sweet corn seeds may be sown this month. Seedlings from former sowings may be planted out, and it would be well to dip the whole plant in water before planting. This greatly assists the young plants while taking hold of the soil in their new location.

Frequent waterings and frequent cultivation will now be necessary; and all weeds must be hoed or hand-weeded out; mulching with stable manure will greatly assist the plants.

A few beds should now be deeply worked, adding a liberal dressing of stable manure. These plots will then be ready for the celery, cabbage, and other seeds planted during this month.

Flower Garden.

Continue to plant out the various bedding and foliage plants, corms of gladoli, and seed of such tender annuals as phlox Drummondi, balsam, zinnia, nasturtium, celosia, aster, cosmos and portulaca.

While seeds planted out in the open germinate and grow fairly well, it is advisable during the summer months to plant these in sheltered seed beds, or in a canvas or calico frame. The protection need be on the one side only, preferably the west or north-west; the seedlings are then protected during the hottest part of the day. At the same time the shading should not be sufficient to unduly "draw" them.

The seeds should not be deeply sown, and all waterings should be light. A little water, often, should be the rule for seedlings. Annuals

require plenty of room when planted out in the garden. Being quick growers, they are generally gross feeders, and they must have space to develop a good root system. Feeding, too, with liquid manure is helpful when they are reaching the flowering stage.

Dahlias may now be planted out, either from tubers or from young rooted cuttings. These will give good early summer blooms. For autumn and show blooms, the planting should be deferred until the middle of December.

Herbaceous and succulent plants should be staked for protection; included in this section are delphinium, gladiolus, perennial phlox, rudbeckia, &c. These plants will all benefit from liberal mulchings and watering with liquid manure when approaching the blooming period. Spring flowering bulbs, corms, and tubers should now be lifted and stored.

The soil surfaces will now benefit from frequent hoeings and stirrings. Constant waterings will be required if the weather be hot or windy, the cultivation should quickly follow the waterings in order that the moisture may be thoroughly conserved. Mulching with stable manure is also beneficial at this season.

REMINDERS FOR NOVEMBER.

LIVE STOCK.

Horses.—All farm horses in constant work at this season should be well fed with last year's chaff or a mixture of old and new, to which a liberal supply of oats has been added. New chaff or hay alone is not recommended, as it has not the sustaining powers of old hay, and is liable to give rise to digestive troubles. Horses require water at frequent intervals; keeping them for a long time without water, and then allowing them to drink to excess is injurious.

An occasional feed of green stuff will be beneficial. In the event of this being unobtainable, give at week-ends a bran mash, to which is added five or six packets of Epsom salts.

Mares which are away from foals for any length of time should have a portion of milk taken from them before foal is allowed to run with them, otherwise serious results may accrue to foal. Good results follow an allowance of chaff and oats to mares and foals running in paddocks, more especially where feed is short.

At this season the Bot Fly is about, and horses should be frequently examined for the eggs of this fly. The neck, forelegs, and jaws are the parts where the eggs are deposited. Either the use of the singeing lamp under affected parts or the application of kerosene will destroy the eggs.

Cattle.—Provide succulent fodder and plenty of clean water and shade. Limewash the cowbails, it helps to keep down flies. Provide "lick" in trough, consisting of salt 20 lbs., bone meal 20 lbs., and sulphate of iron, ½ lb. Look out for milk fever. Read up method of treatment in *Year-Book of Agriculture*, June, 1905. Have cows' milk weighed, and tested for butter fat. Rear heifer calves from cows giving satisfactory results. Continue giving milk at blood heat to calves. Be careful to keep utensils clean, or diarrhœa will result. Do not give too much milk at a time for the same reason. Give half-a-cup of limewater in the milk to each calf. Let them have a good grass run or lucerne, or ½ lb.

crushed oats each per day in trough. Dehorn all dairy calves, except those required for stud or show purposes.

PIGS.—*Sows.*—Supply those farrowing with plenty of short bedding in well-ventilated sties. Those with litters old enough may be turned into grass run. *All* pigs should be given a plentiful supply of clean water. Read Bulletin No. 16. Pig raising and fattening with present price of pollard and bacon should be highly profitable.

SHEEP.—Mate all good young ewes procurable. Fatten and dispose of all broken-mouthed, inferior-fleeced, and very coarse-wooled sorts. Seasons will not always remain favorable. Where ewe lambs are intended to be held for future breeding, see that the cross results in shafty, fine to medium grade fleeces, as well as a shaply frame. Allow rams to remain with the ewes seven weeks, this period admitting of any ewes coming in season the second time. It is rarely necessary to join more than 3 per cent. of 2 tooths, 3 per cent. of 5 and 6 year olds, or 2 per cent. of 2, 3 and 4 year old rams, unless with young ewes. If conditions justify it, 4 per cent. of vigorous matured rams with aged coarse crossbred ewes will bring a greatly increased number of twin lambs. Clear wool and burrs from about the pizzles of rams, and cut hoofs into shape before mating. Ewes should be of one breed, or as near one cross as possible, to ensure an even and rapid dropping. Merino and fine cross ewes are in season earliest, first cross or half-breds later, and all ewes with a preponderance of British blood later still. It is useless to join rams with ewes until their proper time of coming in season. Ewes carry their lambs four months, four weeks, four days, or roughly, five months.

POULTRY.—Add a little peameal to morning mash and give less bran. Feed equal parts wheat and heavy oats at night. Supply plenty of green food—at this time, lettuce is invaluable. Discontinue salts and condiments. Avoid salt meat of any description. Put Douglas mixture in drinking water when required. Keep ample supplies of sand, ashes, &c., in pens, and moisten same. This will enable the birds to keep themselves cool and clean. Top off geese, ducks, and cockerels for the Christmas markets. Hens will do better this month by having free range. Remove all male birds from flocks, as infertile eggs will keep longer and command a higher price.

CULTIVATION.

FARM.—Cut hay in late districts. Cut oats and barley in early places. Finish planting potatoes. Put in late maize for fodder, also millet and imphee. Plough fire-breaks where required. Get stackyard and stages ready for hay.

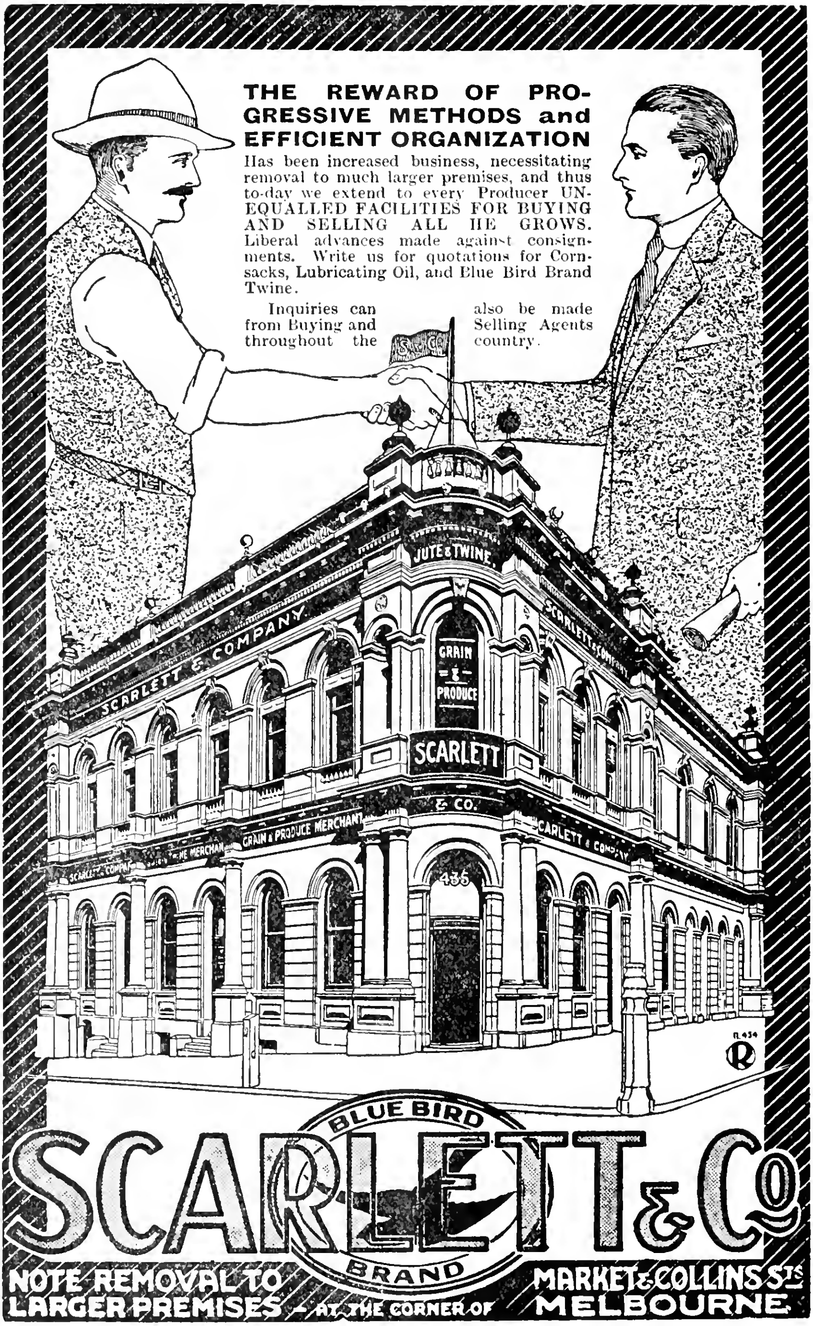
ORCHARD.—Keep the surface loose and free. Suppress weeds. Spray as often as necessary for codlin moth and pear slug. Mulch and spray young trees and grafts with water in the early morning during hot weather.

VEGETABLE GARDEN.—Keep the surface hoed, and allow the plants plenty of moisture. Stake, pinch out, manure, and water tomatoes. Pinch back long runners of pumpkin and melon family. Sow autumn and winter varieties of cabbage and cauliflower. Plant out seedlings in cool weather. Sow French beans. Cease cutting asparagus beds, and top-dress with manure.

FLOWER GARDEN.—Plant out dahlias and gladioli for autumn blooming. Lift and store spring flowering bulbs. Stake, tie, and train growing plants. Sow zinnias and asters. Layer carnations, camelias, daphnes, &c. Water well and keep the surface loose. Keep rose beds fairly dry.

VINEYARD.—Inspect young grafted vines (field or bench); suckering and removal of scion roots should be carefully attended to—See *Journals* for September and October, 1917. Tie up young vines. Beware of cut worms on young vines—See *Journals* for July, 1911, and September, 1913. Tying up of bearing vines, if practised, should be completed early in month. Avoid excessive and indiscriminate topping, far too frequent in Victoria. Scarify, if soil is not sufficiently loose, and after heavy rain or irrigation. Look out for oidium and repeat sulphurings on first appearance of disease. Keep a sharp look-out for Downy Mildew—See article in current issue.

Cellar.—Fill up regularly and keep cellars as cool as possible.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December, 1918.

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THE JOURNAL

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VICTORIA, AUSTRALIA.

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THE JOURNAL

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A WESTERN DISTRICT FARM.

By E. W. Murphy, Dairy Supervisor.

The valley, with its lively stream flowing westward, seemed a delightful place to the explorer Mitchell and his party when they first came to it, near where the town of Hamilton now stands. Reminiscent of homeland scenes, the stream was called the Grange Burn.

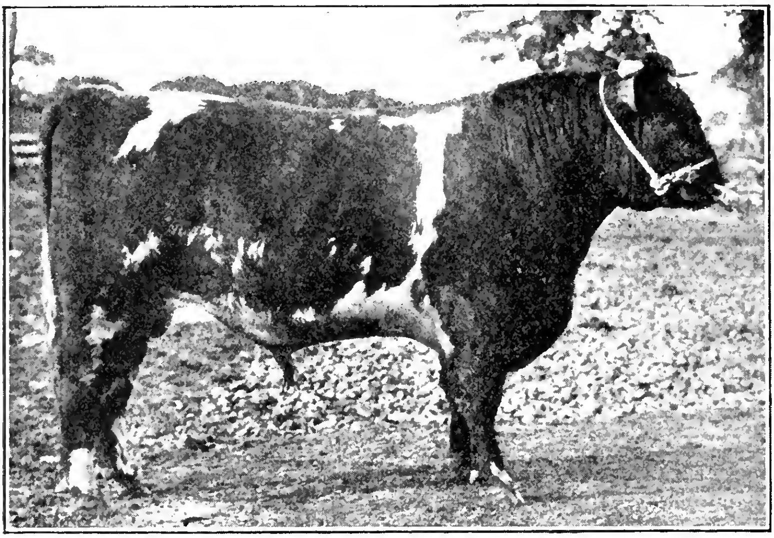
After an interval of eighty years, the place has no doubt a different appearance, yet still there are charming landscapes, but in the main the quality of the pasture has sadly deteriorated, and complaints are often made of stock being unthrifty.

As the old adage says, "A bad workman quarrels with his tools," and so the stockman blames the pasture. A good stockman will study the soils of his pasture lands and prevent or correct faults, instead of wasting time in useless complaining. It is not true that any fool can farm. Farming must be studied and practised in order to insure success. That success includes the leaving of the soil as good, if not better, than it was found. If otherwise, the holder is only an exploiter. Withholding necessary fertilizer is a very shortsighted policy for the grazier. If land decreases in agricultural value it is a sign that the method of working it is at fault. Very often a comparatively small outlay will reproduce the pristine vigour and quality of growth. Wide areas of these western plains were always weak in phosphate, and liberal applications of phosphatic fertilizer are required to induce a growth superior to their original verdure.

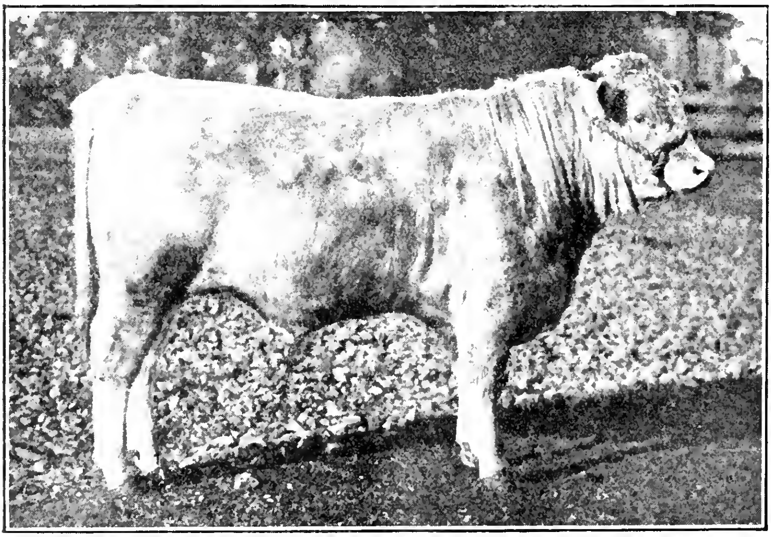
In every district an example is set by farmers who get better returns from their land than do their neighbours. I have heard some attribute this to luck, but it is due to good management. The majority of those who are barely making a living on the land are too ready to believe that their want of success is due to some unknown fault with the soil, or an unfortunate spell of weather. This certainly involves less energy of body or mind than is required to study out the real causes, and improve the management.

17628.

Going westward from Hamilton down the Grange, one is impressed by the rich-looking soils and the magnificent red-gums. The growth of trees and hedges indicates a fairly generous and regular rainfall, though in some seasons it is not well timed, as the winter and spring



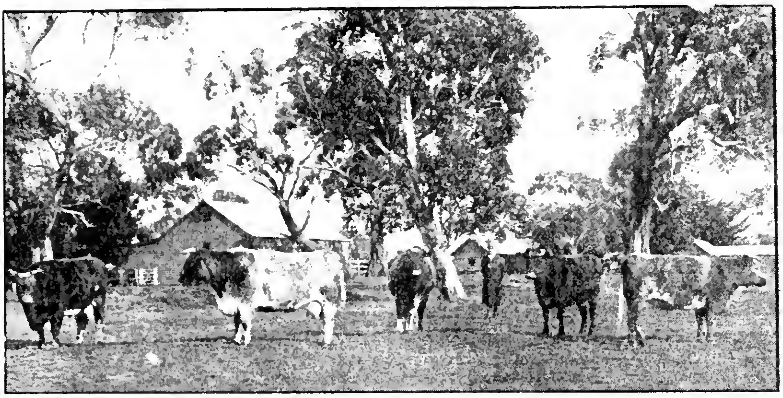
1.—Two-year-old Shorthorn Bull—Grand Duke of Clifton 5th.



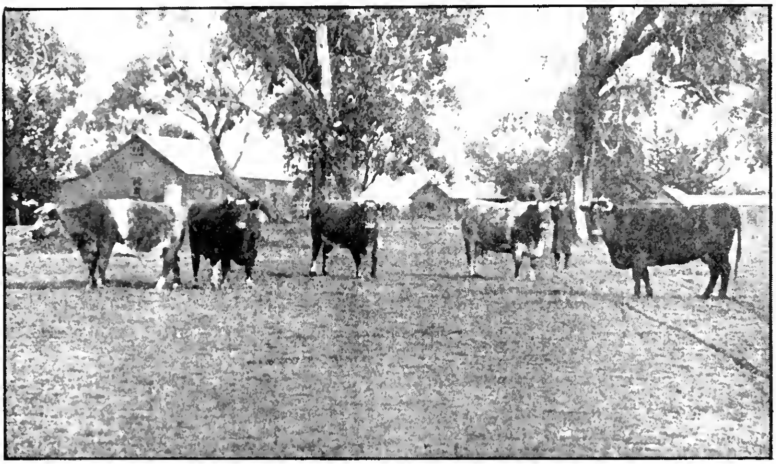
2.—Grand Duke of Clifton 6th, aged ten months.

are wet and cold, the summer dry and windy. Fortunately there is evidence that with proper management land in this district can still uphold its high reputation for the raising of first class stock.

Mr. A. J. Simpson has established a Shorthorn stud farm on the Grange at the junction with the Muddy Creek, where he has been settled for twenty years. The wonderful quality of his stock speaks well for his judgment of land as well as of animals. The "Clifton" Estate comprises some 1,700 acres of land, and the accompanying illustrations give some idea of superior skill in the management of it.



3.—A few of the Shorthorn Herd.



3a.—"Quality and Size."

The first illustration shows a striking picture of a red and white two-year-old Shorthorn bull, Grand Duke of Clifton 5th. His grand-dams were Bolinda Duchess of Derrimut 404th and Bolinda Duchess of Derrimut 400th, and both of them were by the same sire, Bolinda Duke of Derrimut 208th.

The white bull in illustration No. 2 is a very fine specimen of his breed, and was a little over ten months old when this picture was taken.

The cow standing to the right in the group in illustration No. 3 is Bolinda Duchess of Derrimut 400th, the mother of the white bull and the grand-dam of the red and white one. No. 3A shows the same fine cows in a different position.

The next picture shows an attractive group of yearling heifers. The foremost calf—probably the best of the group—is from the same dam as the two-year-old red and white bull shown in illustration No. 1. These growthy youngsters show that feeding as well as breeding has been on right lines. Beyond the group are the banks of the Muddy and Violet Creeks and a cultivation field of nice dark soil. About sixty acres are sown for oaten hay. Green barley and maize are also grown. The soil is well suited for maize, but the spring climate is too wet and cold, and during the growing season the weather is often dry and windy.

Very high prices have been realized for Shorthorn cattle bred by Mr. Simpson. At the Sydney sales in April last, four bulls under twelve months averaged six hundred guineas. In addition to the herd, Mr.

4.—Yearling Heifers.

Simpson runs a fine flock of Shropshire sheep on his property, and the Japanese Government has recently procured from him a third lot of ewes.

The haystacks at "Clifton" are placed well up from the ground-level, on blocks about 2 feet high, and in order to prevent the encroachments of rats and mice large sheets of iron are placed on top of the blocks. Grass hay is also made from about 30 acres of land—a practice which should be more generally adopted by graziers. Some say that the ordinary grass in this district will not make good hay. If, however, they will top-dress a small field with barnyard manure and phosphatic fertilizers, and cut the grass while it is on the green side, they will find that the quality will be quite satisfactory and very handy in a time of scarcity. Being little troubled by rats or mice, it will keep indefinitely, and stock will need no coaxing to eat it.

In former days some losses were incurred on "Clifton," and Mr. Simpson realized that the pasture needed attention. A considerable

amount of farmyard manure is available, and by means of a Mitchell spreader it is broadcasted on the grasslands. Phosphatic fertilizers and lime are also used, and the result is very marked. Not only can more stock be carried, but the old staggy tufts of stale grass disappear, and thus the danger of fungi which cause paralysis is lessened. To the left of the flat, seen beyond the marl bed marked × in photograph No. 5, the line between the dressed and undressed parts of the paddock can be distinguished half-a-mile away, though it is all good land. At one time lime was brought from Cobden. Later on it was found that there was a good, readily-available deposit on the spot. The analysis showed 68 per cent. carbonate of lime and 2½ per cent. of magnesia. To the right there is a high bank of the spur between the Muddy and Grange Creeks. Limestone outcrops on this side, and forms great cliffs, 80 feet high on the other side overhanging the Grange, and the stone yields 93 per cent. carbonate of lime. For 1½ miles above this point there are extensive deposits of limestone and marl, and also,

5.—**Muddy Creek Marl Beds.**

it is believed, a bed of phosphate in payable quantity. Except what Mr. Simpson has used, no attempt whatever has been made to turn this lime to good account, though all about the immediate neighbourhood the need of it is very pronounced.

Down stream the cliffs do not extend, though plenty of limestone crops out on the left bank, and the soil is mostly of a nice dark brown colour. The right-hand bank is darker, and the rocks are of basalt. Both banks look well at a distance, and the soil, on close inspection is attractive in colour and texture. Grass is plentiful, but is of light, harsh, native growths, and staggers, impaction and cripples in cattle, and even deaths from paralysis are not uncommon.

Wheat will not ripen as it used to do, owing to the deficiency of phosphate in the soil. A farmer complained that even the virgin paddocks would not grow the crops that could be raised thirty or forty years ago. He overlooked the fact that grass was a crop, and that

phosphate in the shape of wool, hides, meat, &c., from his farm had been going to market for eighty years past, and that available lime was gradually being washed away from about the grass roots by the heavy rainfall.

Turning from this faulty management, and taking another glimpse at "Clifton," the visitor realizes that business capacity is very evident there, and that a spirit of thoroughness, spelling success, pervades the place.

DAIRYING ON A SMALL AREA.

W. F. Beacom, Dairy Supervisor.

Some people with limited capital hesitate to engage in the dairying business owing to the belief that a large area of land is essential to success. That this idea is erroneous has been repeatedly proved by quite a number of farmers, who, dairying in a small way, are not only making a living, but whose work shows a handsome profit that consistently increases.

It frequently occurs that the dairy farmer with a large acreage is inclined to depend almost wholly upon the natural supply of grass instead of growing a supply of fodder for his herd. Not until a drought or an exceptionally long winter is experienced does the farmer realize how foolish was his oversight in not conserving a supply of fodder, and then, when the times of stress are past, too often he forgets the lesson that has been taught him.

It is a very noticeable fact that large dairy herds have a much lower average than those of small or moderate size. There are many reasons to which this may be attributed, but improper feeding is the chief cause of low average returns. The man on the smaller area soon learns that it is only by cultivating his farm to its utmost producing capacity that he will be able to make his herd satisfactorily profitable; for, even with the best of cows, grazing alone will not go far to sustain a milk supply. The essential factor for success in all small dairy farms is, therefore, cultivation, combined, of course, with proper subdivision of the land, conservation of and careful use of all farmyard manure, and the exercise of good judgment in the choice of foundation stock. These suggestions are very comprehensive, and many people find it difficult to make a beginning on lines which cover the whole of them. Occasionally, however, a most striking example is found where a farmer has begun on a small area without any fundamental point being overlooked, and consequently success has been achieved from the start.

An instance of this recently came under notice when an inspection of a farm in the Whittlesea Shire was being made. A few years ago, Mr. William Horn, of Epping-road, Thomastown, who formerly ran a herd of 60 cows in the Woodstock district, was compelled, by a combination of circumstances, of which ill-health and scarcity of labour were the principal contributing causes, to practically retire from dairy farming on a large scale. Purchasing his present home, surrounding which there are only 10 acres, he for a little time thought he had actually finished with dairying, but his 10 acres of land seemed as wasted to

him if it were used only to run the one cow required to supply sufficient milk for family use. Consequently, a milking shed was built, more cows purchased, and Mr. Horn was soon again amongst the wholesale dairy farmers.

From previous experience he knew the advisableness of commencing with good stock, and, therefore, his selection of cows for his 10-acre farm was most carefully made. Mr. Horn has always believed in feeding cattle properly, and when stocking his smaller establishment determined to purchase only large-framed cows, from which he would be able to turn off big fat cows for slaughtering purposes when their milking term was finished, should it not be desirable to hold them over for another season. Big cows and big milkers have, therefore, been his special fancy, and these heavy robust cattle have given splendid returns on the three feeds per day, which is their regular allowance. For some time past, thirteen cows have been kept in milk on the farm, and the daily ration for these is about 2 cwt. oaten chaff, 50 lbs. bran, and 20 lbs. of pollard; this, with 4 cwt. greenstuff, being equivalent to a

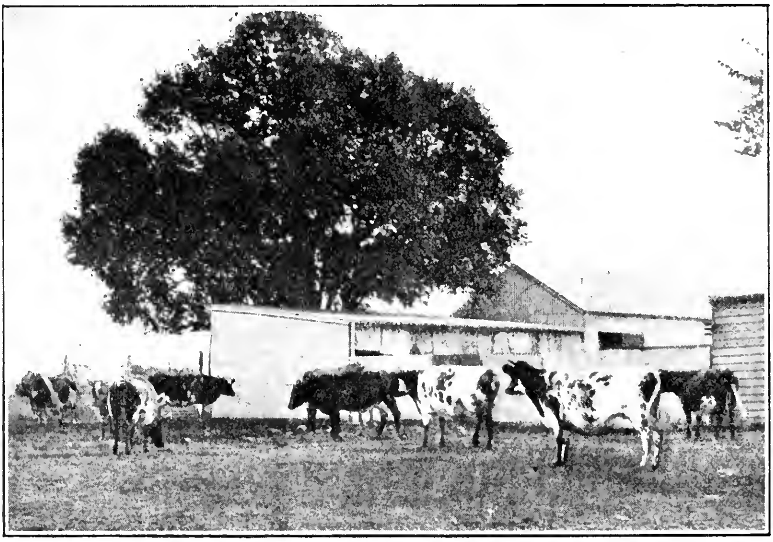
Mr. Horn's Dairy Herd.

total of approximately 58 lbs. of food per cow per day. A photograph of the herd on this page will be sufficient to show the condition of the cattle on this ration at the date of inspection (25th June last), and this excellent condition is maintained throughout the year. The herd is always under Mr. Horn's personal supervision, for he and his son carry out all the work of the farm between them. That they still have time for other work is shown by the surroundings of the home, for the vegetable and flower gardens are also both well kept.

The greenstuff, which forms the major portion of the ration already referred to, is wholly grown on the farm; in fact, two-thirds of the 10 acres is always under a succession of crops of oats, barley, and maize, and half an acre is permanently laid down in lucerne. Strange as it may appear, it is nevertheless a fact that, although there are many acres of first class lucerne land in the Whittlesea Shire, Mr. Horn is one of the very few who have made practical use of this valuable fodder. The cropping is carried out very systematically, the land being kept in good heart by the liberal use of farmyard manure. A good

supply of farmyard manure is one of the advantages of intense dairy farming, as its use keeps the land in a high state of fertility.

The illustration on the next page gives an end view of the farm buildings. The gate opens into a pitched yard with a six-stall cowshed, well bricked and drained; adjoining this is the feedshed, conveniently arranged to eliminate unnecessary handling of fodder. Three feeds of oaten chaff, pollard, bran, and chaffed greenstuff are mixed in a large bin at one time, to be measured out as required. The dairy is a weatherboard structure, lined and ceiled, and brick floored, and here the milk is cooled with well water before being forwarded to the city. The situation of the farm on the main Epping-road allows of the milk being picked up direct from the farm by the district contract milk-carter, who delivers to the retailer in Clifton Hill within about an hour from cooling—a condition of handling which insures the consumer getting a supply as nearly "direct from the cow" as possible.



A View of the Farm Buildings.

The returns from the farm are always the most important feature to the farmer, and are the best indications of successful management. In December last (midsummer) the daily average was 13 quarts per cow; in July, a midwinter month, the average was 10 quarts per cow, which is the lowest return obtained throughout the year. The total milk sold from this farm during last year amounted to 10,676 gallons, or an average yield of about 821 gallons per cow.

There is a big lesson to be learned from these results. It will be readily recognised that a very fair margin of profit remains between the returns from these cows and the money expended on the fodder purchased for them, when it is considered that the average yield of the dairy cow of this State is under 400 gallons per head. So, even allowing for the big expenditure on feed by Mr. Horn, there is still a tremendous amount of leeway to be made up by the average farmer before his profits can be brought within measurable distance of this thirteen-cow dairy.

BOTTLING OF FRUIT FOR HOME USE.

By Miss A. Knight, Fruit Preserving Expert.

Introduction.

The range of women's work is widening almost daily, and one useful way in which it can be profitably extended is in the production and preservation of food both for immediate and future use.

The actual food value of most fruits certainly is not high, but the acids in composition are an agreeable and wholesome solvent of the fibrous portions of a meal. The potash salts and other mineral compounds, in which fruits are rich, are needed in order to keep the blood in a healthy condition, while the fibrous portions give bulk, and tend to promote a healthy condition of the organs of excretion. We often hear it said that "Health is the greatest of all possessions, and is not quoted in the market because it is without price." Therefore the use of plenty of wholesome fruit, when it is in season, should be encouraged, and by preserving it in various ways a good supply for winter use will help to lighten the food bill, and give variety to the table in winter as well as summer. It will also provide a palatable dessert, which can be taken from the pantry shelf and served immediately, without cooking or other preparation. There are also a large number of simple, dainty desserts that can be prepared from preserved fruits, many of which are inexpensive and tasty. The woman who is interested in her home and home life should be able to conserve all the excess products from the garden, orchard, or market purchases at a moderate cost, thereby preventing any waste. The home product, when well preserved, is both attractive and palatable, and many leading grocers have customers who prefer such goods, causing a constant demand for first-class home-made preserves.

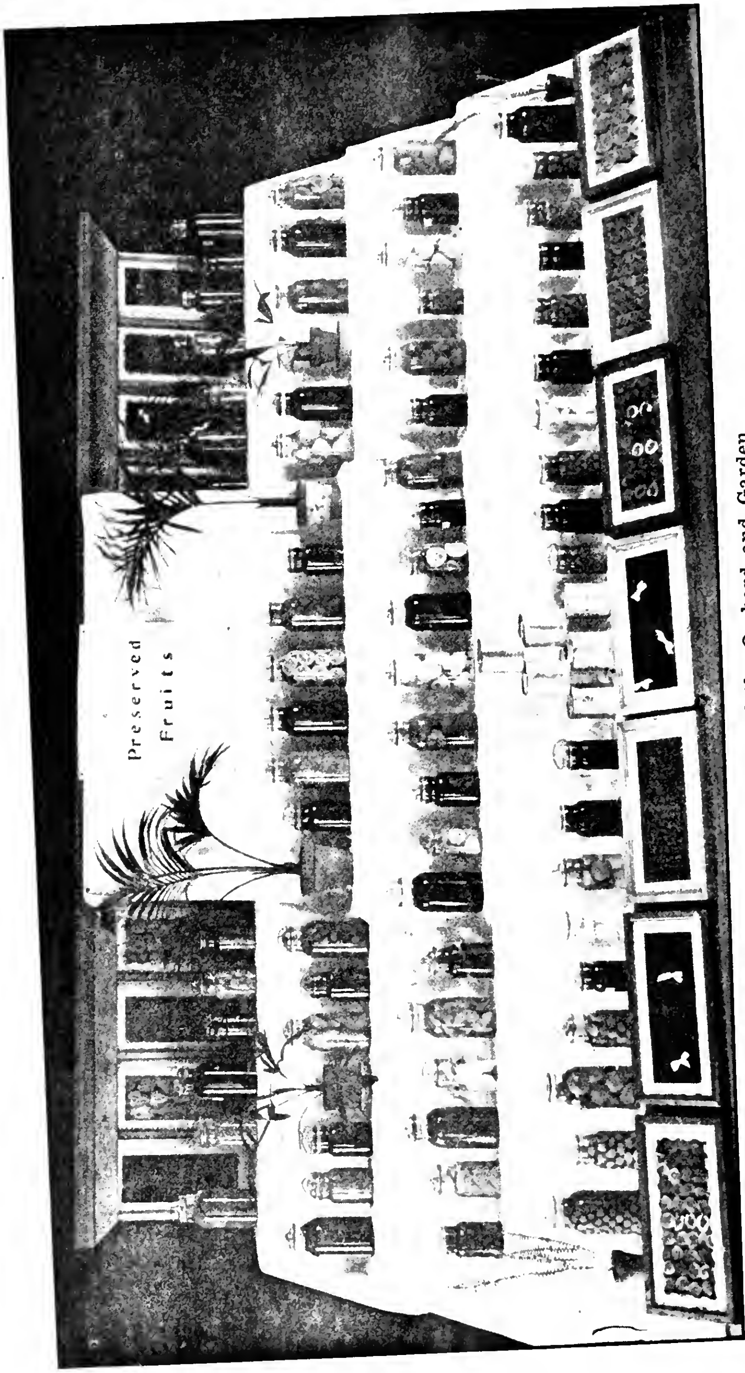
There are a number of ways of dealing with fruit and vegetables, all of which come under the heading of "preserves." Each method, of course, differs very much from the other, yet to be able to make the most of what we have, a knowledge of the different methods will be found to be a distinct advantage, because they can be worked one with the other, thus reducing the possibility of waste.

This article deals exclusively with the bottling of fruits for home use, but other preserves will be dealt with in future issues.

Destructive Organisms.

It is absolutely necessary in the preservation of foods to completely destroy all the minute plant organisms, and if those met in the process of canning or food preserving are not destroyed fermentation or putrefaction will be set up in the contents after the containers have been sealed. Consequently, when preserving food, it must be processed until it reaches a condition in which these minute bodies cannot attack it.

These organisms may be classed, roughly, into three groups—bacteria, yeasts, and moulds. In the following brief outline of the structure and work of these germs it will be seen that their growth on, or in, the food will completely spoil it, the change they cause being known as putrefaction or decay, and as the food decomposes acids, carbonic acid gas, and other useless compounds are formed.



Surplus Products of the Orchard and Garden.

Bacteria are less troublesome in the preservation of fruit than of meat or fish, which contain more nitrogenous matter; they are one-celled, and so small that they can be seen only by the aid of a microscope. The reproduction of bacteria is brought about by one of two processes, the germ either divides into two, making two parts where one existed before, or else they reproduce themselves by means of spores, and within 24 hours, under favorable conditions, the progeny of one cell may amount to millions.

Yeasts and moulds are the more common enemy, usually attacking fruits, while vegetables are chiefly attacked by bacteria, which are harder to kill than yeasts. The latter are also one-celled organisms, that grow less rapidly than the former. They reproduce themselves by a process of budding, and, like bacteria, are invisible to the naked eye, but they are more easily destroyed by heat than bacteria spores. Yeasts are said to be killed at a temperature of 160 deg. F., and, as previously stated, must be destroyed, for should they gain entrance to substances containing sugar and enough moisture they immediately begin to produce alcoholic fermentation, and render the commodity unfit for use.

Moulds reproduce themselves by spores. They are very small, light bodies, easily carried in the air, and, when settling upon favorable material, speedily germinate. Some impart a mouldy flavour to the material, but do not usually cause fermentation in either canned or bottled fruits. It is to destroy completely all organisms, which in this case are our enemies, that thorough sterilization is necessary, and for this purpose an exposure for a given period to a temperature of 212 deg. F. will usually suffice. In some instances a lower temperature, if continued for a longer period, is almost as effective, and is at the same time less likely to injure the flavour and texture of the more delicate kinds. There are, however, in some foods more hardy and resistant bodies, which, being surrounded by a heavy covering, make them more resistive to heat, and they manage to live and retain their vitality for a long time, even when exposed to conditions which kill the parent germ, but with the system of fractional or intermittent sterilization one is able to overcome this difficulty. This extensive or further prolonged heating, of course, would not be necessary, nor suitable, for fruits, most of which require simply a brief heating, but it enables the canning and bottling of the more difficult vegetables, such as peas, beans, &c., to be successfully preserved in the home where only kitchen appliances are available, though, of course, where the processing of these vegetables is done under steam pressure the destruction of such active agents is rendered possible within a comparatively short time.

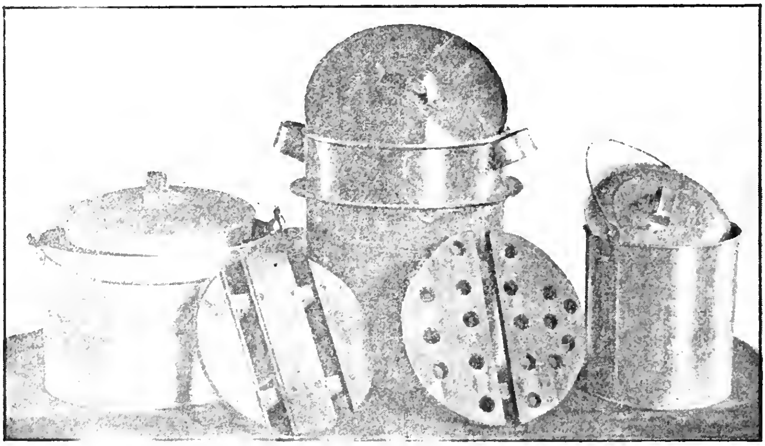
Sterilizing Vats.

The principle of sterilizing is the same, whether applied to fruit bottled for home consumption or canned for market. Commercial canning and bottling differs from home methods only in minor details, in which economy of time and labour is of greater consideration. It is also very necessary that all appliances coming into contact with the contents of jar or can should be thoroughly sterilized.

Many are surprised when they realize how simple an equipment is necessary in order to conserve general or surplus products for an occasion when they are not available in fresh form. Any boiler or cooking utensil, having a well-fitting lid, provided it is deep enough for the

purpose, may be used as a sterilizer, but the conditions under which housekeepers are situated at various times make one vessel more convenient than another, but it may be said that each has its merits; these, however, will be more clearly understood if described or illustrated.

Any of the understated vessels may to advantage be utilized for house and family use for two good reasons—little expense, combined with first class results. In the first place, one of the most important parts of the installation—a sterilizing vat—though not made especially for the purpose—is to be found in practically every kitchen or home in the form of an ordinary washing copper, clothes boiler, kerosene tin cut lengthwise, a large tin "billy," fish kettle, or any other such vessel which is deep enough to permit the jars or other containers to be properly covered. Of these, the washing copper, having the advantage of being larger, is perhaps the most convenient, and the only appliance required to convert it into a satisfactory sterilizing vat is a false wooden bottom or shelf, a couple of inches less in diameter than the vessel, and made



Suitable sterilizing vessels and false bottoms or shelves.

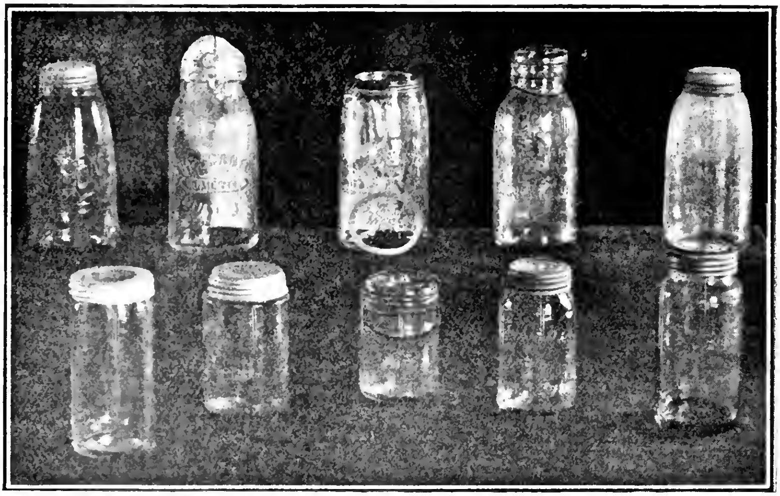
either of several strips of wood or in one piece. It should be well perforated, and have two cleats about 3 inches in height. The sleats should be nailed on the underside, making the shelf about 4 inches high. The spaces or perforations will allow the steam to pass through and circulate around the jars, as the processing is done by steam in the upper section of the boiler. The object of this stand or shelf is to raise the bottles slightly above the bottom of the vessel, and enable the glass jars which rest on it being stood slightly apart, so that during processing they may not come in contact with each other, thereby preventing breakages. A lid or cover of some description is required to prevent the steam escaping too freely; if a very loose-fitting wooden lid is used, a wet grain bag placed over it would be a great help, though, of course, a well made cover would not require it. The stand should be placed in the copper, with sufficient water to reach just below its surface, the containers, after being filled as described, placed on the stand with their lids either loosely on or laid beside them, the copper covered, the water brought rather slowly to boiling point, and the fruit processed for the necessary length of time.

Where a washing copper is not conveniently available, or is considered too large for the quantity to be treated, any of the other vessels mentioned will answer the purpose, and, if not on hand, can be purchased at small cost. They are all easily handled, and may be used on gas, open fireplace, kitchen range, or other fire, and would, of course, require to be fitted with wooden platform, as described, but of a shape to suit the vessel selected.

Suitable Containers.

The only additional outlay worth mentioning would be that for suitable jars or containers. This item of expense is heavy only for the first year, for, with ordinary care, the jars give many years of satisfactory service.

Glass jars of several types for the purpose are obtainable, but any jar or container which can be made quite airtight will be suitable. It



Miscellaneous Containers.

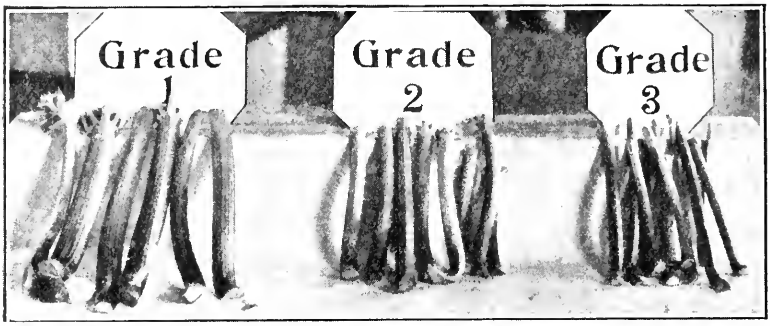
is advisable to make sure that the lids fit each individual jar; they may be tested by placing each cover on its jar without a rubber band, and if it rocks when pressed with the fingers it is defective, but will sometimes perfectly fit another jar of the same make. The wire clamps should be tightened, if necessary, each time the jar is used. The screw top jars are favoured by some preservers, while others find these difficult to screw and handle while hot.

Most of the zinc top lids have a porcelain or glass setting inside the lid, which is very necessary, as the zinc should not be allowed to come in contact with the contents, because of the acid contained in many fruits. Gold-lacquered caps are often used; these caps are washed in lacquer, and claimed to be unaffected by vegetable or fruit acids which come in contact with it.

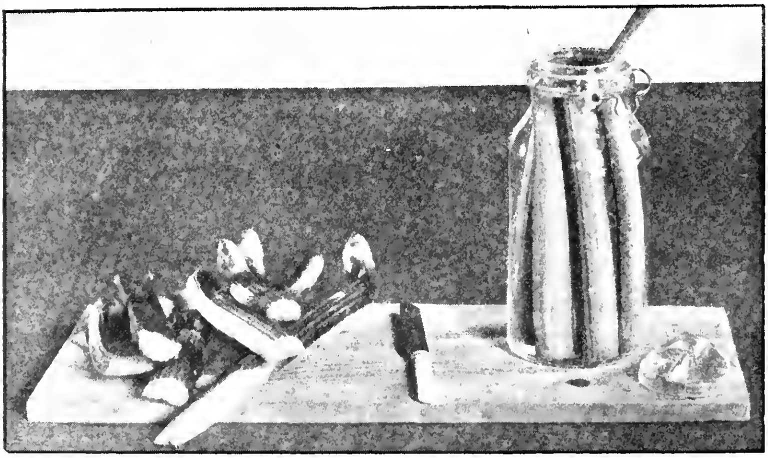
Some of the preserving jars are made of a tinted glass, which give the preserve a dull or darkish appearance, so that it is not so attractive in appearance, but this is of little importance, as the fruit keeps equally as well in these jars, provided they are airtight.

Glass jars demand careful treatment, so as to prevent breakages. The work must not be carried on in a draught of cold air, nor should the hot glass come in contact with cold metal, or be splashed with cold water, &c. Care must also be taken when sterilizing bottles for this or other purposes not to place the jar suddenly into hot water, nor to pour hot liquids into dry glass jars. These may seem small matters, though they are of great importance to the beginner, who would probably have to learn them by experience.

Pickle bottles may also be utilized for bottling small fruits; these require deep corks, which need to be sterilized, and should fit the bottle



Graded Rhubarb.

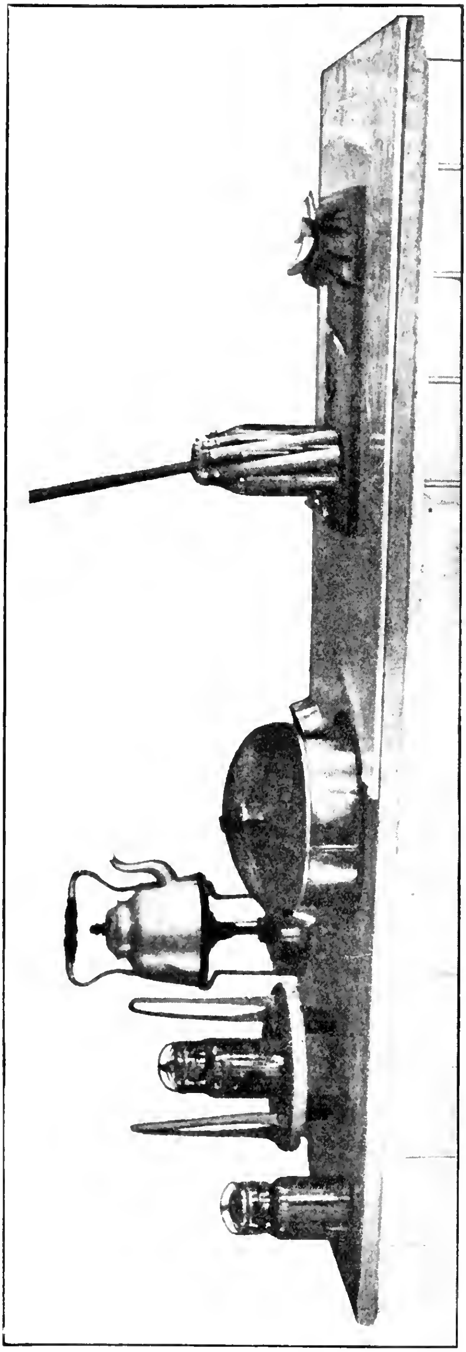


Showing method of packing Rhubarb into jar.

very tightly; then, after corking, and while the contents are still quite hot, cover with weasand or sealing wax; the latter process may be done by melting a little in a small tin vessel and dipping the top of the bottle to a depth of, say, half-an-inch.

The Selection and Classification of Fruit.

This is a matter of importance, as much of the success attained in bottling and preserving in general will depend upon a good selection for



A Work Table.

each purpose. It is advisable always to grade the fruit carefully, using each for the purpose for which it is best suited, some grades being better adapted to one form of preservation than another; for instance, bottling and canning, pulping, drying, jams, jellies, and pickling of both fruit and vegetables all come under the heading of "preserves," though, of course, the selection or grading and treatment in each case is vastly different, and, if unnecessary waste is to be avoided, each portion must be used to the best advantage.

The product to be bottled or canned should be of that quality which could be classed as first grade. It should be of good colour, with a firmness of flesh, free from blemishes, have a good pronounced flavour. It should not be overripe, as it requires to be sufficiently firm to stand the application of heat to which it is subjected, and still retain the natural shape.

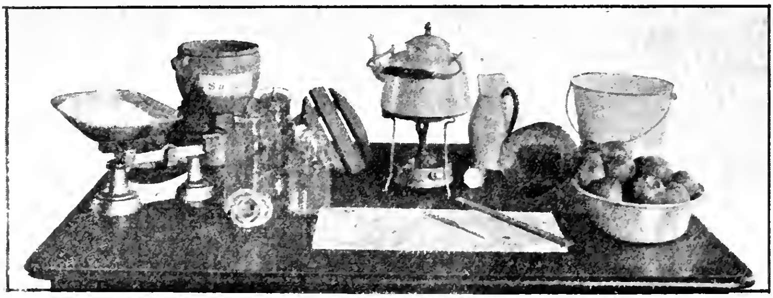
Generally speaking, a mid-season fruit is preferable to the early, the former being firmer, and usually of a better flavour.

In order to make the package attractive in appearance, the fruit should be regularly and neatly packed in the container, and be of uniform size, so that the cooking will be evenly done throughout the jar, otherwise the smaller or riper fruits will be overcooked.

Sterilizing (Steaming Method).

After preparing the fruit it should be packed firmly into jars, using for the purpose (when required) a flat blunt packing stick made of soft white wood, taking care not to penetrate the skin of the fruit; often slight pressure is used to advantage; a good, firm pack avoids excessive empty space, due to shrinkage after cooking. Just a small quantity of cold syrup (about a tablespoonful) should then be poured into the jar with the raw fruit, except in the special cases mentioned later, when the jar must be filled to the brim with syrup.

The lids should not be fastened down, but simply placed loosely on each jar, and the sealing levers must not be tightened until after processing. Sterilize for the desired length of time, according to the variety of fruit, stage of ripeness, size of package, &c. Gently fill each jar to overflowing with boiling syrup, which should be ready in a kettle, or some other convenient vessel, then adjust the rubber rings on the jars, and immediately fasten or screw down the lids, as the case requires.



Another Work Table.

Lift these finished jars carefully out of the vat, and allow them to cool slowly on a damp folded towel, which is a protection to the bottle. As previously stated, working in a draught must be avoided, or breakages with the glass containers may occur.

It is very necessary that the jars, rubbers, lids, or caps should be in a good sound condition, so that no air can gain admittance. As the temperature of the contents of the jars gradually reduces, there should be strong suction, caused by the contraction and cooling of the contents, and if any leakages of air are observed (these will be indicated by air bubbles entering the jar around the lid or rubber band), the sealing levers must be released and the defect remedied before finally sealing.

Store in a semi-dark pantry, so as to protect the bright colour of fruits, as they may fade if constantly exposed to bright light.

Preparation.

After grading, wash all fruit thoroughly; where convenient, a spray of water is desirable, as sand and grit are more easily removed in running than in still water; this can be managed by attaching to the tap a small piece of hose or tubing, with a sprinkler on the end, which can be gently moved about over the fruit, the tap being only partly turned

on, as a strong stream would probably damage such soft fruits as raspberries, loganberries, blackberries, mulberries, currants, &c. No fruit should be left in water for any length of time, but when sufficiently washed it should be drained, placed in jars, and slowly processed for, approximately, eight to ten minutes at boiling temperature. Careful treatment and correct cooking is necessary for berries, as the retention of shape is important.

Different fruits require different periods of exposure to heat in order to become thoroughly processed. The periods given below for processing mean from the time the water in the vat reaches boiling point—not before—and in each instance applies to quart or 2 lb. jars, while the time necessary for processing larger or smaller containers varies somewhat.

Peaches are usually peeled and pitted, the peeling being sometimes done by hand, though some housewives, when treating a large quantity, prefer to put the fruit in a wire basket, or piece of open buttercloth, and immerse for a few seconds (according to degree of ripeness) in a caustic soda bath, which breaks or loosens the outer skin or peel without damaging its quality; a 10 or 15 per cent. solution of caustic soda at boiling temperature is used for this purpose. After immersion, the fruit should be thrown into a vessel of cold water, and the skin carefully rubbed off.

Freestone peaches may be easily pitted or stoned by making a clean cut around the fruit, using a sharp knife, then gently twisting the two halves in opposite directions, when they will easily separate, and the pit or stone can be readily removed.

Clingstone varieties require the use of a pitting spoon with which to remove the stones. Several kinds of peaches are very suitable, the Crawford and Muir being both liked.

The time required for processing a quart jar of peaches is from 20 to 30 minutes at 212 deg. F., according to variety and stage of maturity.

Apricots.

These are sometimes bottled whole, but some like to have the stone removed and the fruit halved. Where economy of space is desired, halving the larger specimens is advised, but for a showy and attractive pack many prefer the whole fruit, where the perfect shape can be retained. The time required for processing apricots of a medium stage of ripeness packed in 1-quart jars would average 15 to 20 minutes at 212 deg. F. The Moorpark, Hemskirk, and similar varieties are good.

Pears.

It is well to note that pears should be bottled as quickly as possible after peeling, for if exposed to the air for a lengthy period after peeling they will quickly turn a dirty brownish colour, due to the action of an oxidizing enzyme. If for any reason the fruit is allowed to stand after peeling before processing it is advisable to cover them with water slightly salted, in order to avoid the oxidation and browning that will otherwise occur. (Lemon juice or a little citric acid added to the water will also meet the case.)

The William Bon Chretien is a favorite pear for bottling, having white flesh and a fine flavour, and should be treated when ripe. This variety of pear is often stored when in its green unripened state, and allowed to mature; close attention will be necessary in order to select from day to day those which have reached the exact stage of ripeness required for preserving. The Kieffers and other varieties preserve well. Time for processing ripe William or other pears of a similar nature is from 15 to 20 minutes, though winter varieties require much longer, and, as a rule, give a deeper colour when cooked.

Nectarines.

This fruit is generally halved, and the stones removed. The fruit is sometimes peeled, but this is not necessary. Time for processing, about 10 to 15 minutes.

Plums.

Plums are washed and sorted; stones may be removed or allowed to remain. Time for processing is about 8 minutes at 212 deg. F., or 20 minutes at a temperature of 160 deg. F.

Quinces.

Quinces should be peeled and divided into convenient sizes and shapes to suit the preserving jar. Take the same precaution regarding discoloration as with pears, and prepare only as many as can be cooked while still retaining their colour and freshness. Process, from 15 to 60 minutes, according to colour of preserve desired. A prolonged cooking gives a pink to red result; short cooking gives a clear golden colour. Some prefer the latter, but others the former; both look well; jars of each colour give variety.

Cherries.

Wash and grade, remove stems without tearing the flesh, pack firmly into jars, and process for about 15 to 20 minutes. The Florence and Margaret Bigarreau and others are generally used.

Gooseberries.

Gooseberries may be bottled when either green or ripe. They are graded, topped, and tailed with a knife or other convenience. Time for processing is 8 to 10 minutes at 212 deg. F., or 20 minutes at 160 deg. F.

Loganberries.

As described for raspberries.

Currants—Red and White.

Wash lightly and remove from the washing water at once. The berries may either be removed from the stem or may be left in bunches. Time for processing is 8 minutes.

Black Currants.

Black currants require about 10 to 15 minutes processing.

Mulberries and Blackberries.

Mulberries and blackberries should also be washed quickly and removed from the water, drained, sorted, and packed carefully. Time for processing, 10 to 15 minutes.

Oranges.

Oranges, though not commonly preserved, are very tasty in this form if bottled in a heavy syrup made of 12 oz. sugar to each pint of water, and boiled for a few minutes. Having cut the oranges into thick slices, drop them in and simmer for half-an-hour; then allow them to stand till cool, and pack the slices neatly but firmly into the jar, strain the syrup, fill the jars to overflowing, and then place them in the vat as in the case of other fruit, and heat for about 40 minutes before sealing. This particular preserve improves by keeping, and should be stored at least several weeks before using. The syrup will then have become strongly flavoured with the orange and the peel saturated with syrup. If a very mild preserve is required, steep either the whole or the sliced fruit in fresh cold water over night; then drain and, if desired, repeat the process. The navel orange is a favorite, but other sweet sorts may be used. The pips should, of course, be carefully removed.

Mandarins.

Mandarins are treated similarly to oranges, excepting that they are usually preserved whole.

Pineapple.

Peel and carefully remove the "eyes," cut into convenient shapes, or neat round slices; it is optional whether the core be removed or allowed to remain, but the former method is generally favoured. Usual time for processing is 30 minutes, but longer will not harm.

Rhubarb.

Rhubarb for this purpose may be classed and treated as a fruit, and for convenience preserved either in water only or a weak syrup. It may be firmly packed in jars in long evenly graded sticks or cut into short (say, 1 inch) lengths, the latter being an economical method, as there need be no waste. Time for processing, 8 to 10 minutes.

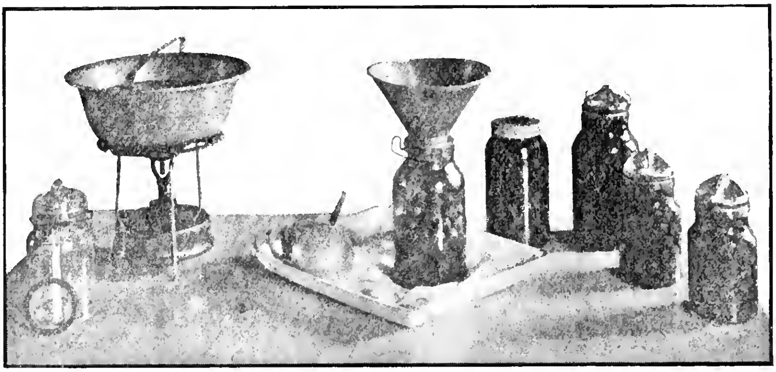
The Open Pan System.

This is another successful way in which fruit may be preserved, and is a very simple process.

The preserving pan or any flat-bottomed enamel-lined or aluminium pan would be suitable, and the cooking may be done on either a gas stove or ring, kerosene stove, kitchen range, or on an open fire. Prepare in the usual way only as much fruit as can be cooked while it still retains its freshness and good colour; put it in the vessel and pour over it sufficient syrup to well cover the contents; then bring gradually to boiling point and gently cook. Care must be taken not to boil too rapidly or the fruit will become broken, and lose in appearance. The time required will depend upon the variety of fruit under treatment, but until cooked through is sufficient.

Raspberries or extremely soft berry fruits are not altogether suitable for this method, as they incline to lose their shape, and are liable to suffer to a certain degree when being ladled from pan to bottle. Firmer fruits are more suitable.

Preparation must be made to see that the containers are ready to receive the boiling fruit the moment it is cooked. It will be necessary to heat the glass jars before they are filled, in order to prevent breakage. When ready, place the hot bottle on a damp folded towel in a shallow dish, and using an aluminium funnel having a sufficiently wide outlet to permit a ready passage for the fruit, gently fill the jar to overflowing with the boiling fruit and syrup from the preserving pan, wipe the rim of the jar, and make sure that the rubber ring which goes on next is carefully flattened in its groove or on the shoulder of the jar, as the case may be, and see that no particle of fruit or seed from the fruit finds lodgment there, as this would probably cause a leak. Then firmly and quickly fasten the lids by means of the wire clip, or screw tightly according to jar, and allow to cool gradually. As in the sterilizing



Jars being filled with boiling fruit and syrup.

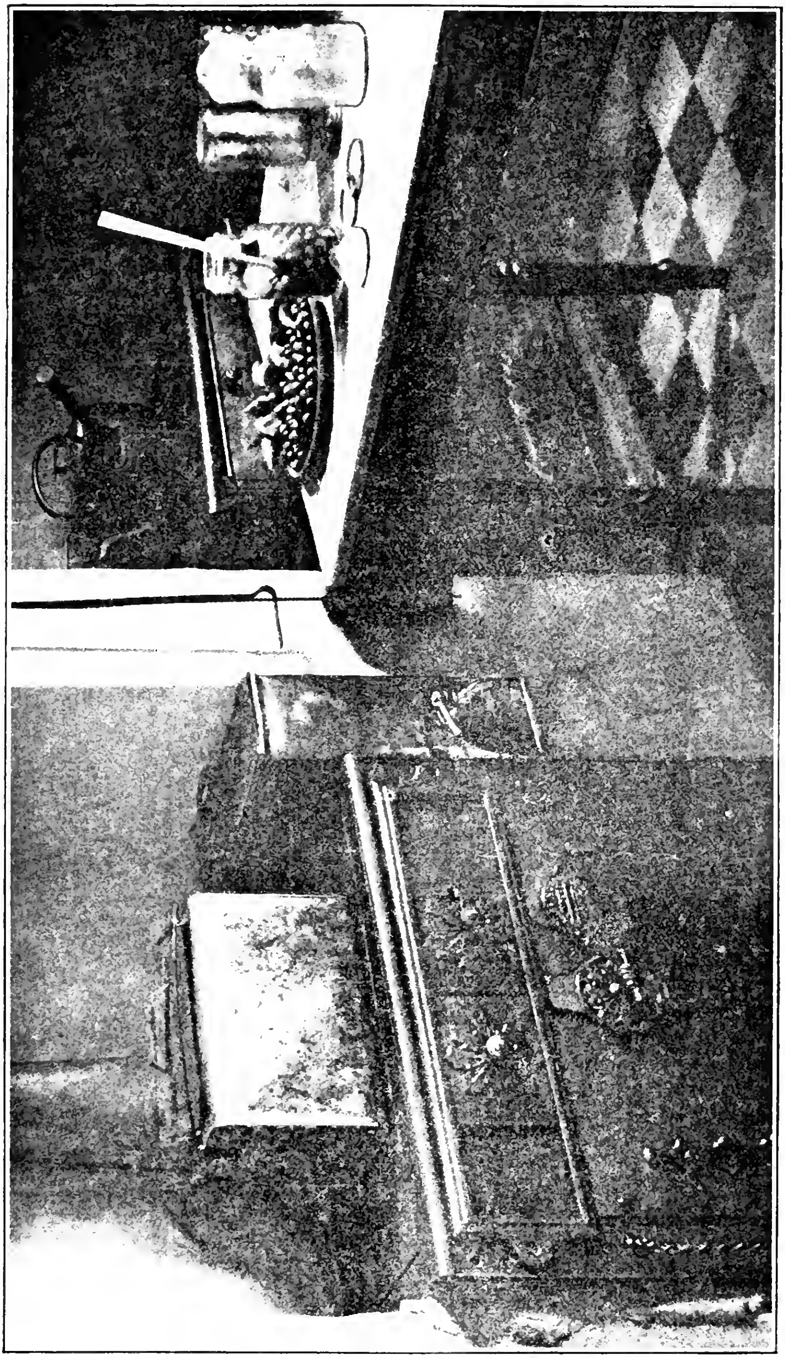
method, it is necessary to work away from a draught, and to make sure that the jars are airtight.

A convenient way to sterilize the utensils and bottles for this purpose is to heat them gradually in a separate pan of clean water; they may be all set on a wooden rack or meat roaster, with a folded cloth over the wires. Fill the bottles with water, stand them in an upright position, and pack the ladles and other utensils around the jars. The rack or meat roaster serves the purpose of keeping the jars from direct contact with the bottom of the pan. The bottles should be permitted to remain with the water boiling in them for a few moments, then drained and filled while still hot.

An Old Way.

Another method which is over 100 years old, but still much used, is as follows:—

The fruit should be selected, graded, and prepared as previously described, then packed into the jars, and each filled with cold syrup,



The Kitchen.

(Note the cheap sterilizing vessel.)

and the lids put tightly on. The jars may then be placed in the copper or vat containing enough cold water to reach to about the shoulder of the jars; each one being packed around with straw or cloth to prevent the several bottles from rattling together when the water boils, and possibly causing breakages.

The whole is brought gently to boiling point, and allowed to remain for the required length of time for cooking, which would be gauged according to variety and stage of ripeness. Then the jars should immediately be sealed and made air-tight while at boiling point.

Good results are obtainable by this method, but the disadvantage is that there is a certain amount of unnecessary work attached to the packing around the jars, and more time and fire required to heat the body of water contained in the copper or vat. Time and firewood are both saved by sterilizing with steam as in the first method described.

Syrup.

The syrup in which the fruit is preserved may be of any desired strength, and may be varied according to taste and convenience. When the amount of sugar is large the syrup is described as being "dense" or "heavy," but where a small quantity is used to the same amount of water, it is, of course, "weak" or "light." A heavy or strong syrup will cause the fruit to rise to the top of the jar, leaving a space of clear syrup below. This does not matter in the least for household use, but is unsightly, and when intended for exhibition purposes would be very much against it.

From 4 to 8 oz. of sugar to a pint of water makes a medium syrup, which would be suitable for most fruits, and is palatable; but quantities may be varied to suit individual requirements.

In making or preparing syrup, the water is measured into a kettle or other convenient vessel, brought to boiling heat, the sugar weighed according to the strength required, then added to the water, and the whole boiled for 8 or 10 minutes. If the boiling be unduly prolonged, the water evaporates, leaving a stronger or heavier syrup than intended. Strain through a clean piece of muslin before using. The fruit may be put up in plain water without the addition of any sugar, and will keep equally as well, and the necessary sweetening may be added when using the fruit. The only advantage in preserving in plain water is when the fruit is intended for the making of pies, puddings, &c., and the sugar can be added at that time; but when the preserves are bottled for use as a dessert, the flavour is very much better if the fruit be put up in syrup rather than in water.

. . . .

The only utensils needed in the work of bottling fruit are those shown in the illustrations of the work table, and need not be particularized, as they are to be found in every kitchen.

If the foregoing instructions are carefully carried out, and care taken to obtain air-tight containers, there should be no chance of failure, and the preserves should keep indefinitely.

MOTOR TRACTOR TRIALS.

The Royal Agricultural Society of Victoria, in connexion with the Annual Show, September, 1918, arranged for a series of trials with motor tractors. The Field Ploughing Tests were held at the State Research Farm, Werribee, during the week before the Show, and the tractors were subjected to further technical tests at the University, Melbourne, after the Show. Mr. William Ross was appointed to report on the ploughing and an Engineers' panel, comprising Professors Payne (Professor of Engineering), Mr. W. N. Kernot (Lecturer on Engineering), and Mr. E. J. C. Rennie (Lecturer on Agricultural Engineering), was appointed to make the necessary observations and report on the technical points. The report to the Society is as under, and deals with the following :—

1. Ploughing Performances—
   - (*a*) Fuel consumption test.
   - (*b*) Dynamometer test.
   - (*c*) Mr. William Ross's report on ploughing.
2. Engines' Performances—
   - (*a*) Normal load test.
   - (*b*) Maximum load test.
3. Description of Tractors—

   As the conditions under which the trials were to be conducted was that the competing tractors were not to be placed in order of merit, the judges herewith present the full results obtained from the various trials.

1. Ploughing Performances.

(*a*) *Fuel Consumption Test.*

Tests were conducted at the Government Research Farm, Werribee, on 19th and 20th September, 1918, for the purpose of determining efficiency of eight competing motor tractors when used for ploughing.

Table I.

—	Bates' Steel Mule. Clutterbuck Bros.	Imperial E.A.A.—McDonald and Co.	Waterloo Boy—Mitchell and Co.	Sunshine "O"—H. V. McKay.	Imperial Light-weight—McDonald and Co.	Mogul—International Harvester Co.	Crude Oil Tractor Jelbart Pty.	Sunshine "A"—H. V. McKay.
Plot Number	1	2	3	4	6	7	8	10
Acres ploughed	3·50	3·54	1·40	1·79	2·12	2·82	3·57	3·63
Ploughing, in hours ..	3·67	3·75	4·69	4·69	3·11	4·50	2·82	4·45
Kerosene fuel, in gallons ..	8·49	10·27	7·21	5·11	4·99	11·99	5·96	6·00
Benzine fuel, in gallons ..	0·81	0·67	0·37	0·29	0·28	0·07	0·30	1·73
Total fuel, in gallons ..	9·30	10·94	7·58	5·40	5·27	12·06	6·26	7·73
Total water, in gallons ..	8·07	4·62	0·55	9·09	5·25	10·61	6·85	15·60
Acres ploughed per hour ..	0·95	0·94	0·30	0·38	0·68	0·63	1·27	0·82
Fuel per acre, in gallons ..	2·66	3·10	5·41	3·02	2·49	4·28	1·75	2·13

TABLE I.—*continued.*

Type of Plough.	Mitchell Mould-board.	Mitchell Mould-board.	Mitchell Mould-board.	Sunlock Mould-board.	McKay Disc.	I.H.C. Mould-board.	Robinson—King Disc.	McKay Disc.
Furrows per run ..	6	9 and 5	5 and 4	4	8	3	13	6
Total number of furrows ploughed	192	200	77	96	106	114	208	204
Width ploughed, in chains	1·830	1·850	0·730	0·935	1·334	1·475	1·870	1.900
Average width of furrow, in inches	7·5	7·3	7·5	7·7	6·6	10·3	7·1	7·4

The depth of ploughing was set by Mr. William Ross (the ploughing judge) at 4½ inches. The actual acreage ploughed by each tractor was measured. The total time taken up in ploughing includes turning at each end, but does not include delays due to accidental stoppages.

The conditions of the test were such as not to allow of accurate determination of the amount of the lubricating oil used.

(*b*) *Dynamometer Test.*

Independently of the fuel consumption tests, a series of autographic dynamometer tests were taken, the results of which are recorded below. The depth of ploughing was fixed at 4½ inches.

TABLE II.

—	Bates' Steel Mule—Clutterbuck Bros.	Imperial E.A.A.—McDonald and Co.	Waterloo Boy—Mitchell and Co.	Sunshine "O"—H. V. McKay.	Imperial Light-weight—McDonald and Co.	Mogul—International Harvester Co.	Crude Oil Tractor Jelbart Pty.	Sunshine "A"—H. V. McKay.
Plot Number	1	2	3	4	6	7	8	10
Length ploughed, in chains	38·22	38·22	38·22	38·22	31·00	38·22	38·22	19·11
Time ploughed, in minutes	14·81	17·23	18·66	15·02	15·52	12·22	19·75	6·72
Ploughing speed, in miles, per hour	1·93	1·61	1·54	1·91	1·49	2·34	1·45	2·13
Average pull, in lbs. ..	2,250	3,415	1,585	1,670	2,740	1.730	3,285	2,760
Average width of furrow, in inches	7·5	7·3	7·5	7·7	6·6	10·3	7·1	7·4
Pull per inch width of furrow, in lbs.	49·7	51·8	52·8	54·1	51·9	55·0	*35·5	*62·5
Average ploughing h.p. ..	11·62	15·17	6·50	8·50	10·97	10·72	12·94	15·7
Maximum pull, in lbs., over short period	..	5,700	2,600	2,750	3,600	2,900	6,700	3,000

* In these two cases there is doubt as to depth of ploughing over all, the furrows being the same as the observed open furrow.

(c) *Mr. William Ross's Report on Ploughing.*

The character of ploughing was judged by Mr. Wm. Ross, and his report is here incorporated, so that it can be read in conjunction with the foregoing tabulated results :—

Steel Mule Tractor, pulling one six-furrow Mitchell low mouldboard plough, did very good work, especially on one side of, and, where there were no stones. This lot was nearly all stiff clay, and was well down to the required depth of 4½ inches. The plough was handled by one man.

McDonald's E.A.A. Tractor, pulling one five and one four furrow Mitchell mouldboard plough. This cut was also mostly in stiff clay and some very large stones. It was a very good job in that kind of land, and well down to the required depth. The plough was handled by two men.

Waterloo Boy Tractor, pulling one five-furrow mouldboard plough (Mitchell and Co.). This tractor and plough were handled by one operator; seemed to get along slowly at the start, but improved as time went on. Did good work in that kind of land—stiff clay at one end in particular—and was well down to the depth.

McKay Tractor, Sunshine "A," pulling a four-furrow mouldboard McKay plough. By the time this lot was reached there was less clay. This cut was neatly ploughed, and a very good job generally, and well down to the depth. One man on the plough.

International Tractor, pulling one three-furrowed mouldboard imported plough. The clay had disappeared from the surface of the land. This tractor and plough were handled by one man, and seemed to be very easy to manage. The plough made a very useful job, and was well down to the depth.

Imperial Tractor (light), pulling two four-furrow McKay disc ploughs. These two disc ploughs made a really good job (as disc work is done). The plough was managed by two men, and was well down to the depth.

Jelbart Bros.' Tractor, pulling one three-furrow disc, one four-furrow disc, and one six-furrow disc, or thirteen discs in all, of T. Robinson and Co. They made a very good job until half finished; after that they worked too shallow. Worked by two ploughmen.

McKay Tractor, Sunshine "O," pulling two three-furrow discs. These ploughs practically worked too shallow all the time. Worked by two ploughmen.

2. Engine Performances.

Tests were conducted at the Engineering School, University of Melbourne, from 1st to 7th October, 1918, for the purpose of determining efficiency of the engines under normal and maximum load conditions.

The engines were belted to a dynamo, the output was measured with standardized instruments, and the generator loss was separately determined, and has been allowed for, as shown in Tables III. and IV.

The tractor entered as Sunshine " O " was not presented for these tests.

(a) Normal Load Test.

TABLE III.

—	Bates' Steel Mule—Clutterbuck Bros.	Imperial E.A.A.—McDonald and Co.	Waterloo Boy—Mitchell and Co.	Imperial Light-weight—McDonald and Co.	Mogul—International Harvester Co.	Crude Oil Tractor Jelbart Pty.	Sunshine " A "—H. V. McKay.
Time of run, in hours	1·435	2·000	As the engine was not running satisfactorily the tests were discontinued.	1·312	2·000	1·984	2·062
Average amperes.. ..	57·7	103·2		54·6	44·2	49·0	42·6
Average volts	213·7	216·4		220·0	225·0	220·0	208·6
Load, in kilowatts ..	12·33	22·35		12·00	9·95	10·80	8·88
Generator loss, in kilowatts	1·11	2·27		1·02	0·87	0·94	0·83
Total load, in kilowatts ..	13·44	24·62		13·02	10·82	11·74	9·71
B.H.P. hours	25·85	65·90		23·01	29·00	31·20	26·83
B.H.P.	18·06	33·00		17·45	14·50	15·73	13·01
Total kerosene fuel, in pints	29·6	60·0		22·4	20·0	25·6	20·0
Fuel, in pints, per B.H.P. hour	*1·145	0·910		0·978	0·690	0·821	0·745
Total water, in gallons ..	2·00	4·62		3·53	8·50	1·75	6·00
Water, in gallons, per B.H.P. hour	0·077	0·070		0·153	0·293	0·056	0·224

* The engine was not working to its best advantage during the test.

(b) Maximum Load Test.

TABLE IV.

—	Imperial E.A.A.—McDonald and Co.	Imperial Light-weight—McDonald and Co.	Mogul—International Harvester Co.	Crude Oil Tractor—Jelbart Pty.	Sunshine " A "—H. V. McKay.
Time of run, in hours	0·596	0·536	0·552	0·500	0·558
Average amperes	114·0	65·8	52·1	65·5	54·0
Average volts	212·0	221·0	219·4	218·5	212·0
Load, in kilowatts	24·20	14·53	11·42	14·30	11·44
Generator loss, in kilowatts ..	2·83	1·25	0·99	1·25	1·05
Total load, in kilowatts ..	27·03	15·78	12·41	15·55	12·49
Brake horse-power	36·22	21·15	16·63	20·84	16·74
B.H.P. hours	21·60	11·34	9·18	10·42	9·34
Total kerosene fuel, in pints ..	20·0	11·2	7·2	10·4	7·2
Fuel, in pints, per brake horse-power	0·926	0·988	0·784	1·000	0·771
Total water, in gallons ..	4·62	2·17	1·00	2·00	3·75
Water, in gallons, per brake horse-power hour..	0·214	0·191	0·109	0·192	0·401

A table of the main points of the various tractors is given on pages and .

In conclusion, we desire to thank the competitors for the help which they so willingly rendered, thus greatly facilitating the running of the various tests, both at Werribee and at the University.

3. Description of Tractors.

A table of the main points of the various tractors is given below :—

TABLE V.

—	Imperial "E.A.A."	Imperial Lightweight.	Jelbart.	Mogul, I.H.C.
Height	8 ft. 7 in. ..	8 ft. 4 in. ..	7 ft. 0 in. ..	7 ft. 0 in.
Length over all ..	15 ft. 0 in. ..	13 ft. 2 in. ..	13 ft. 0 in. ..	13 ft. 6 in. ..
Wheel base ..	9 ft. 9 in. ..	8 ft. 1½ in. ..	7 ft. 2 in. ..	8 ft. 6 in. ..
Width over all ..	8 ft. 4 in. ..	5 ft. 5 in. ..	6 ft. 7 in. ..	5 ft. 9 in. ..
Tread	4 ft. 4 in. .. on front wheels	5 ft. 4 in. ..	6 ft. 0 in. back .. 4 ft. 4 in. front ..	4 ft. 7 in. back .. 2 ft. 7 in. front ..
Front wheel dia.	3 ft. 0 in. ..	3 ft. 0 in. ..	2 ft. 11 in. ..	3 ft. 0 in. ..
Back wheel dia. ..	5 ft. 4 in. ..	5 ft. 4 in. ..	5 ft. 7 in. ..	4 ft. 6 in. ..
Front wheel width	6 inches	6 inches	4½ inches ..	6 inches .. ..
Back wheel width	18 inches ..	12 inches ..	12 inches ..	10 inches ..
Belt	Tight on top ..	Tight on top ..	Tight on top ..	Tight on bottom ..
Speeds in miles per hour	2·25 or 2·95 } forward; 2 reverse ..	1—1·5, 2—2·1, 3—3·16 } forward; 0·7 reverse ..	1—1½, 2—4, 3—6 } forward; 1¾ reverse ..	2⅛ forward; 2⅜ reverse ..
Weight on front axle	tons ct. qr. lb. 1 8 2 0	tons cwt. qr. lb. 1 3 0 7	tons ct. qr. lb. 0 14 1 0	tons ct. qr. lb. 0 15 2 14
Weight on back axle	tons ct. qr. lb. 3 15 0 0	tons ct. qr. lb. 2 1 1 7	tons ct. qr. lb. 2 10 3 21	tons ct. qr. lb. 1 16 1 0
Total weight ..	tons ct. qr. lb. 5 3 3 7	tons ct. qr. lb. 3 4 1 7	tons ct. qr. lb. 3 5 0 21	tons ct. qr. lb. 2 11 2 0
Type of Steering Gear	Worm and nut encased	Worm and worm wheel enclosed, chains with concussion springs	Bevel gear and chain worm exposed	Worm and worm wheel exposed, spring shock absorbers
Minimum Turning Radius	41 ft. 6 in. ..	29 ft. 6 in. ..	28 ft. 0 in. ..	20 ft. 0 in. ..
Brakes	Hand brake on high-speed pulley	Hand brake on high-speed pulley	Hand brake on gear pulley, emergency band on differential axle	Brake operated by by hand wheel and screw
Control	Gear shift by lever hand control on governor	Gear shift by lever hand control on governor	Gear shift by lever hand control on governor	Two air controls, one fuel control; for starting. Fuel and water controls for running
Engine	4-stroke cycle vertical	4-stroke cycle vertical	2-stroke cycle horizontal	4-stroke cycle horizontal
No. of cylinders ..	2	1	1	1 .. ..
Bore	8½ inches ..	8½ inches ..	7 inches	8 inches .. ..
Stroke	9 inches	9 inches	9½ inches ..	12 inches ..
Belt pulley, r.p.m.	500	500	400	400 .. ..
Maker's rated h.p. on belt pulley	40	20	14	16 .. ..
Fly-wheel ..	Solid disc. 3-ft. diameter	Solid disc, 3-ft. diameter	Two fly-wheels, one on each side, 41-in. diameter, 4-in. face, five spokes	Diameter 3 ft. 6 in., 3¼-in. face, six spokes

TABLE V—*continued.*

—	Imperial "E.A.A."	Imperial Lightweight.	Jelbart.	Mogul, I.H.C.
Belt pulley ..	20-in. diameter; 6-in. face	18-in. diameter, 6-in. face	24-in. diameter, 6½-in. face	20-in. diameter, 10-in. face
Suspension ..	3 point, bolted to channel frame	3 point, bolted to channel frame	3 point, no springs	3 point
Oiling	Splash pump in sump	Splash, pump in sump	Gravity, sight feed	Mechanical lubrication
Governor ..	Throttling governor in oil-tight case, hand-control lever	Throttling governor in oil-tight case, hand-control lever	Hit or miss type, hand control	Throttling governor enclosed and running in oil
Ignition.. ..	H.T. magneto, with quick brake	H.T. magneto, with quick brake	H.T. magneto with quick brake	L.T. magneto break in cylinder
Carburetter ..	Schebler, vaporizer beyond carburetter in manifold	Schebler, vaporizer beyond carburetter in manifold	Own make, vaporizer on cylinder head	I.H.C., mixer and pre-heater, vaporizer in cylinder head
Cooling Arrangements	Radiator 2 ft. 11 in. long, tubes ½-in. diameter with gills, centrifugal circulating pump; fan for forcing draught; radiator spring mounted	Radiator 2 ft. long, tubes ½-in. diameter with gills; radiator spring mounted; centrifugal circulating pump. Fan for forced draught	Tank, thermo-syphon circulation, 3 feet high, 2-ft. diameter	Hopper-cooled cylinder
Fuel Tanks ..	Tanks on standards across tractor; gravity feed; 12-gallon tank for water injection	Capacity, 14 gallons kerosene; 5 gallons benzine	One double-compartment tank above cylinder—kerosene, 8 gallons, benzine 1 gallon; gravity feed	16 gallons capacity, under tractor frame; fuel pump and overflow from carburetter
Drive	1 forward, 1 reverse, changeable; bull pinion for speed change	3 forward, 1 reverse; friction clutch	1 forward, 1 reverse, belt, jockey pulley and gear-box; link belt, 5 inches wide, ¾ inch thick	1 forward, 1 reverse; epy-cyclic gears; chain drive
Gear Box ..	In case	In case	In case	Planetary gears, specially arranged casing
Bull Pinions ..	4½-in. face, 2-in. pitch; internal gear drive; eleven or fourteen teeth	2-in. face, 1¾-in. pitch; internal gear drive eleven teeth.	4-in. diameter; external gear drive	None; chain drive..
Usual Retail Selling Price	£800	£519	£495	£380 .. ..

(Table continued on next page)

TABLE V—*continued.*

—	Sunshine "A."	Waterloo Boy.	Bates' Steel Mule.	Sunshine "O."
Height .. Length over all .. Wheel base ..	8 ft. 3 in. .. 12 ft. 10 in. .. 7 ft. 10 in. ..	8 ft. 0 in. .. 11 ft. 0 in. .. 7 ft. 6 in. ..	6 ft. 7 in. 14 ft. 9 in. 8 ft. 10 in.	
Width over all .. Tread	6 ft. 0 in. .. 6 ft. 0 in. back .. 5 ft. 6 in. front ..	6 ft. 0 in. .. 5 ft. 10 in. back .. 4 ft. 10 in. front ..	8 ft. 10 in. Maximum 7 ft. 5 in.	
Front wheel dia. Back wheel dia. ..	3 ft. 3 in. .. 4 ft. 1 in. ..	2 ft. 4 in. .. 4 ft. 4 in.	2 ft. 8 in.	
Front wheel width Back wheel width	6 inches .. .. 14 inches ..	6 inches .. .. 12 inches ..	7 inches Caterpillar, 15 inches wide	
Belt	Tight on top ..	Tight on bottom ..	Tight on bottom	
Speeds in miles per hour	1—1½, 2—2½, 3—4 forward .. 1½ reverse ..	2½ forward	1—2⅓, 2—3½ forward 2½ reverse ..	1—1¾, 2—3, 3—4¾ forward 1¾ reverse
Weight on front axle	tons ct. qr. lb. 0 15 0 21		tons ct. qr. lb. [illegible]	tons ct. qr. lb.
Weight on back axle	tons ct. qr. lb. 1 6 1 0			
Total weight ..	tons ct. qr. lb. 2 1 1 0		tons ct. qr. lb. 2 16 3 0	tons. ct. qr. lb 1 7 0 0
Type of Steering Gear	Motor car type, exposed	Worm and worm wheel corrugated, chain drum, spring cushions to absorb shock	Motor car type, exposed	
Minimum Turning Radius	31 ft. 6 in.	.. .. ..	30 ft. 0 in.	
Brakes	Hand brakes on belt pulley	Foot brake on differential shaft		
Control	Hand control on governor; extra air valve	Gear shift by lever hand control on governor	Gear shift by wheel indicator for gears on back of fuel tank	
Engine	4-stroke cycle vertical	4-stroke cycle verzontal	4-stroke cycle vertical	
No. of cylinders ..	4	2	4	4
Bore	4⅛ inches ..	6 inches	4¼ inches ..	3⅜ inches
Stroke	5½ inches ..	7 inches	5¾ inches ..	5 inches
Belt pulley, r.p.m.	800–1,100 ..	750	850	1,200
Maker's rated h.p. on belt pulley	27	24	30	15
Fly-wheel ..	None	Diameter 2 feet, 4-in. face, six spokes	Disc, with clutch	

TABLE V.—*continued.*

—	Sunshine " A."	Waterloo Boy.	Bates' Steel Mule.	Sunshine " O."
Belt pulley ..	10½-in. diameter, 5-in. face	12-in. diameter, 10-in. face	8-in. diameter, 8½-in. face	
Suspension ..	.. .. ..	3 point	3 point	
Oiling	Oil pump ..	.. .. ..	Forced feed and splash	
Governor ..	Throttling governor belt-driven, with hand control	Throttling governor gear driven	Throttling governor ball bearings, running in oil bath	
Ignition.. ..	H.T. magneto ..	H.T. magneto, impulse starter	H.T. magneto, direct driven from cam-shaft	
Carburetter ..	Two carburetters—one for kerosene, one for benzine; mixer own patent, in exhaust manifold	Schebler, pre-heater in exhaust manifold	Bennett, pre-heater in exhaust manifold	
Cooling Arrangements	Special type radiator; thermo-syphon circulation	Honeycomb radiator; centrifugal pump and fan	Tank 2 ft. 2 in. diameter, with air-cooling pipes running through it; centrifugal pump on extension of cam-shaft	
Fuel Tanks ..	Fuel tank, two compartment; gravity feed	Kerosene tank, 20 gallons capacity, over front axle	Two - compartment tank 28 inches long, 18 inches diameter, at back of tractor	
Drive	Sliding gear, 3 forward, 1 reverse; friction clutch; no gears in mesh when doing belt work	1 forward, 1 reverse; cone clutch actuated by foot pedal	Multiple disc clutch	
Gear Box ..	.. .. ..	In case		
Bull Pinions ..	Special roller pinion; internal gear drive			
Usual Retail Selling Price	£500	£420	£460	£350

COPPER FUNGICIDES FOR VINE DISEASES.

By F. de Castella, Government Viticulturist.

(Continued from page 678.)

Substances which may be added to Bordeaux.

In addition to acid, neutral and alkaline (or basic), Bordeaux mixtures, a considerable number of formulæ have from time to time been suggested, and more or less widely used, in which the innovation consisted in the introduction of some substance capable of modifying the chemical or physical nature of the mixture. The addition of casein has already been fully described (see pp. 598 and 675). As this appears to be the most useful of all suggested additions, it was dealt with thus early, so as to secure insertion in the October issue, thus making the information concerning it available for the spraying season then about to start.

Though it would be out of place to consider in detail all the other additions which have been suggested, a few of the more important ones may be briefly considered; some of them may possibly be recommended as novelties here, and a brief indication of the advantages and defects of each may prove useful.

Sugar or Treacle.—The addition of sugar to Bordeaux mixture was strongly recommended by Michel Perret in 1896. Of the many "improvers" which have been suggested, it is still one of those most worthy of attention; curiously enough, however, "sugar Bordeaux" seems to have largely gone out of fashion, so that it is now not extensively used. In his original communication,* Perret pointed out how, in order to combat fungus diseases more efficiently, the copper should be rendered soluble, so that its protective action might be insured from the very start of growth. With this object in view, he tried the solubilization of copper by sugar, so as to form a soluble copper saccharate (*sucrate*) quite harmless to vegetation. This substance, owing to its adhesiveness, resists the action of rain, thus dispensing with the repeated sprayings necessary with most other mixtures. He suggested the mixing of lime saccharate (*sucrate*) and copper sulphate. On thoroughly stirring this powder into water, it entirely dissolves, yielding, by a double exchange of bases, a spray mixture composed of lime sulphate, precipitated copper oxide, and copper saccharate, the solution of which is of a fine green colour. Of the copper saccharate thus obtained, one-half is in solution; this acts strongly on fungi, whilst it offers no danger to the vine. The mixture can, therefore, be used with impunity from the very start of growth. Three kilos per hectolitre (15 lbs. to 50 gallons) is the strength he recommends.

A composite sugar Bordeaux was subsequently advocated. This can be obtained by the addition of treacle to ordinary or standard Bordeaux mixture (containing 2 per cent. of copper sulphate crystals), at the rate of 1 gallon of treacle to 50 gallons of spray mixture. The treacle should be diluted and well mixed with about five times its bulk of water, and stirred into the Bordeaux before its final dilution to the 50-gallon bulk (see p. 559). In this composite mixture the treacle simultaneously

* *Revue de Viticulture*, 22nd February, 1896.

increases solubility and adhesiveness. Treacle usually contains about half its weight of uncrystallizable sugar; it should be free from glucose. Sugar may be substituted for treacle, about half the weight being necessary.

Sugar Bordeaux, containing smaller quantities of treacle (or sugar), has sometimes been recommended; according to Gastine, however, Perret's original formula (1 gallon treacle to 50 gallons mixture) should be retained in order to obtain a complete measure of adhesiveness.

It is sometimes claimed that the addition of sugar or treacle enables Bordeaux mixture to remain in good order and fit for use for several days after its preparation, a point which is, however, of little importance, since the preparation of fresh mixture for each day's spraying presents little difficulty if the directions detailed in last issue be followed.

Soap.—Lavergne was one of the first to recommend soap mixtures, concerning which very numerous articles have appeared in the French viticultural press during the past twenty years. Lavergne does not claim to be the inventor of the method; he recalls* having seen trials of soap Bordeaux as early as 1894, though without any very striking results. He relates how Dr. Mangin, in 1896, drew his attention to the value of soap for the preparation of a mixture capable of thoroughly wetting all vine surfaces. The first season's experiments were not altogether satisfactory, but further trials in 1897 led to the discovery of a mixture of similar composition and consistency to copper soda, and with satisfactory wetting and adhesive power.

The soap used was not that of Marseille (white soap), the basis of which is oil and soda, but the green or black soap prepared by means of caustic potash solution and the oils of colza, rape, &c. (this would, no doubt, be a soft soap). This soap is obtainable commercially in the form of a stiff paste; it has the advantage of being cheaper and more readily soluble in water than ordinary Marseille soap.

The formula, which was employed on a large scale, was as follows:—

Black soap, 1,000 grammes (2.2 lbs.).
Copper sulphate, 500 grammes (1.1 lbs.).
Water, 100 litres (22 gallons).

The copper sulphate is dissolved in a few litres of water. The soap is separately worked up with a little water, in small lots at a time, by means of a spatula. When quite fluid, it is thoroughly stirred into the bluestone solution, and made up with water to the final bulk.

Since Lavergne's first communication numerous soap-Bordeaux formulæ have appeared, into the composition of which many very different kinds of soap have been made to enter. We thus have Bordeaux mixtures with ordinary soap and with soaps made from linseed oil, castor oil, &c. Rosin soap has also been largely used for the purpose.

Vermorel and Dantony have conducted a considerable amount of research work in connexion with soap mixtures of recent years, and have communicated numerous notes, describing their results, to the French Academy of Science. One of their most important recommendations is to use soap as rich as possible in oleate of soda, and free from excess of soda carbonate and alkaline hydrates. Stearate of soda, which is plentiful in most soap powders, should be avoided. It increases surface tension to a noticeable extent, and reduces the solubility co-efficient.

* *Revue de Viticulture*, 26th June, 1897.

In 1911, they recommended a formula for what they termed a colloidal copper soap, as follows:—

(*a*) Dissolve 500 grammes (1.1 lbs.) in 50 litres (11 gallons) water.

(*b*) Dissolve 2,000 grammes (4.4 lbs.) in 50 litres water.

When mixing the two solutions, the usual procedure should be reversed, and the copper poured into the soap solution, instead of soap into copper. Operating thus, instead of a voluminous greasy precipitate of copper soap, an opaque bluish-green liquid is obtained, which has a surface tension as low as that of a simple solution of alkaline soap, which wets the bunches, just as alcohol would. The same authors recommended, a couple of years later, in view of the difficulty of procuring soaps rich in soda oleate, the preparation of a home-made castor-oil soap, as follows:—

Castor oil, 1 kilo. (2.2 lbs.).
Caustic soda, 150 grammes (5¼ ozs.).
Water, 250 c.c. (9 fluid ounces).

The caustic soda is dissolved in the water, and the hot solution stirred into the oil. The mixture soon thickens to such an extent as to prevent further stirring; it should then be left to itself for twelve hours. This soap is extremely soluble in water.

Rosin soap mixture (*Bouillie à la colophane*) figures in most French viticultural text books. This may be dealt with here, though, strictly speaking, it should be considered under the heading of copper soda, since rosin is more usually added to that spray mixture than to Bordeaux. Ravaz* mentions it as follows—it is worthy of note that he does not say much for or against its use:—

Colophane (Rosin) is a mixture of different fatty acids; in combination with soda it forms a soap which serves for the preparation of spray mixtures. The rosin floats on the surface, forming a thick froth which thoroughly wets the green parts of the vine. In order to prepare a mixture, dissolve 2½ lbs. soda carbonate in a gallon of water; heat to boiling point, and add 2½ lbs. powdered rosin. Stir until dissolved. This soap is then poured into the copper sulphate solution, and carbonate of soda added until neutralisation takes place. This spray mixture was first suggested by M. Perraud. It has given good results.

Several of the household soaps in general use here contain up to 20 per cent. of rosin. A rosin soap mixture may thus be made by simply stirring a certain proportion of a solution of such a soap into the spray mixture. The quantity required to communicate sufficient wetting power can be determined, as recommended by Ravaz, by dipping a vine leaf into the mixture. If this remains properly wetted after withdrawal, the proportion of rosin soap is sufficient.

Concerning the addition of soap to Bordeaux generally, it is worthy of note that of late it has gone quite out of fashion in France. Casein seems, in fact, to have altogether displaced it; this substance possesses all the virtues of soap, in the direction of increased wetting power and adhesiveness, without its defects; so much so that Vermorel and Dantony, who have contributed so many interesting articles concerning soap mixtures a few years back, have now abandoned their soap formulæ in favour of the addition of casein mixture to ordinary Bordeaux mixture.

* *Le Mildiou*, p. 176.

THE RUTHERGLEN BUG

(*Nysius vinitor.*)

A Destructive Pest to Potatoes, Tomatoes, Grapes, Peaches, &c.

By C. French, Junr., Government Entomologist.

The small insect called the Rutherglen bug, or Rutherglen fly, which is a true plant bug, is one of the worst pests that orchardists, vignerons, and growers of vegetables have to contend with. In orchards and vineyards, the bugs damage the fruit in all stages of development, causing it to become shrivelled and fall off. The punctures made by the bugs cause small brownish markings, somewhat resembling bitter pit in apples, to appear under the skin of the fruit. In New South Wales it has been recorded as a wheat pest, but the authorities there state that it has not become a serious trouble in their western areas. This is probably due to the fact that wheat ripens early in those districts, and consequently is too hard to be attacked when the bugs begin to appear.

The insect is of a dirty-brown colour, measuring about two lines in length; the body is at first of a light greyish-brown, but later becomes almost black in colour. They sometimes appear in countless numbers during October, November, December, and January, and have caused considerable losses to growers of fruit, especially peaches, apricots, and tomatoes.

Rutherglen bugs have also been responsible for the falling off in the honey production in Victoria, owing to its swarming in the Eucalyptus and other flowers, and abstracting the nectar. Mr. Beuhne, the Government Bee Expert, has made careful observations regarding their attack on some of the best honey flora, and I fully agree with him when he says that these insects caused apiarists severe losses last season. Fortunately, the bugs appear only in such vast numbers as those of last year once or twice every few years, the previous heavy devastations by them having been seven years before.

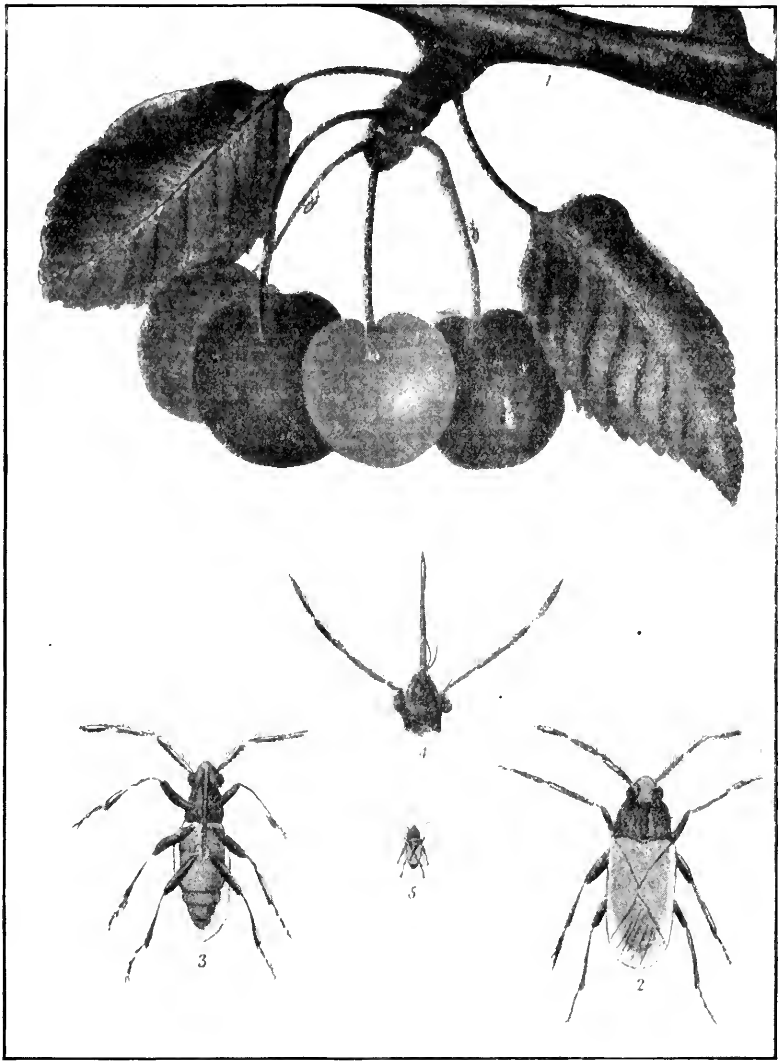
Like all other plant bugs, this insect is furnished with a kind of beak, with which it pierces the flowers and fruits. It then commences to suck the sap; flowers turn dark-coloured, and fruit shrivels up.

The eggs of the bug are deposited in clusters amongst rubbish and weeds, or under the soil, at the end of the summer. From the time the bug leaves the egg, it goes through various moulting stages, casting the skin at regular intervals, until it reaches the final moult, when it emerges as a fully-winged insect.

This insect can be kept in check by the use of benzole emulsion (1 lb. of benzole emulsion to 5 gallons of water), kerosene, or tobacco sprays. The recent smudge fire experiments have been very successful in Victoria and elsewhere. When a gentle breeze is blowing, smudge fires are started at intervals along the trees, and a little sulphur is sprinkled on them. The fires should not be placed too near the trees.

The phenyle spray was used against Rutherglen bugs with good results in the Goulburn Valley last season by Mr. Fletcher, Orchard Supervisor. The formula adopted was:—

1 quart phenyle,	1 bar yellow soap (2 lbs.).
3 lb. washing soda,	40 gallons of water.



Rutherglen Bug.

1. Branch of cherry tree with fruit and with insects. (Natural size.)
2. Perfect Insect; under view. (Magnified.)
3. Perfect Insect; upper view. (Magnified.)
4. Head of Adult Insect. (Magnified.)
5. Adult Insect. (Slightly magnified.)

—From *A Handbook of the Destructive Insects of Victoria*, Part I., by C. French, Sen., F.L.S., &c.

The soap is shredded and dissolved in hot water, and the other ingredients are added.

As the eggs of the bugs are placed on stems, grass, and weeds, or rubbish on the ground, it is absolutely necessary to destroy all such harbors either by ploughing the weeds, &c., into the ground, or by spraying them with benzole or other emulsions, tobacco water, or phenyle sprays.

One of the methods found satisfactory in New South Wales in attacking the bugs when they infest trees is to start early in the morning, before the sun is up, and while the resting bugs are semi-torpid, and to shake them out of the branches into a dish of water and kerosene placed on the ground beneath.

A 9-foot sheet of galvanized iron can be converted into a shallow dish by any handy man by turning up the ends and sides. A gallon of water should be placed in this pan with a pint of kerosene; the latter will form a thin scum of oil on the surface of the water, which will kill every bug as it drops in. A dish of this size placed under the tree and pulled round as the branches of each section of the tree are either shaken or tapped sharply with a stick around which a bit of bagging has been tied to prevent the bark being bruised will be an object lesson to an orchardist, as it fills with falling bugs. This operation will not be effective after sunrise, as then the bugs, being stimulated, will grip to the branches or will fly away.

Unfortunately, they suck the sap from fruit with their rostrum or beak, and from flowers from beneath the epidermis, and thus they cannot be poisoned with the arsenical sprays that are used with much success against chewing insects, such as codlin moth grubs, cutworms, cherry borer, painted apple moth, vine moth, and others.

The only means of destroying them is to use contact sprays. Spraying should be performed on dull days, or towards evening, when the sun's rays are not too hot.

Kerosene torches have proved most successful in some places against this pest. Mr. Sage, of Wentworth, New South Wales, uses an old rake handle, at the end of which he fixes a ball or rags about the size of one's fist. This he dips in kerosene from a jug, which he carries about with him, lighting it and waving the lighted torch through the trees, and the fumes kill the bugs instantly.

The greatest care must be exercised not to leave the torch too long in one place, or the foliage may get singed. It is surprising how quickly this method can be worked; in fact, Mr. Sage says that in a slow walk round the trees the pest is effectually conquered.

A tobacco spray which has given good results against Rutherglen bugs is made as follows:—

Tobacco stems or tobacco dust, 2 lbs.
Water, 4 gallons.

The following is the formula for its preparation:—Put the tobacco in the water, enough to cover, which may be either hot or cold. Place over a fire, and, when the water has reached boiling point, remove some of the fire and allow the water to simply simmer for fully an hour, when the liquid is ready to the drained off, diluted to the above proportions, and applied. Care should be taken that the water does not boil violently, or the nicotine will be driven off. If whole-leaf tobacco is used, prepare as above, using 1 lb. of tobacco to each 4 gallons of water.

STANDARDIZED PACKING AND GRADING OF FRUIT.

By Ernest Meeking, Senior Fruit Inspector.

(Continued from Page 307.)

FRUIT CASES ACT.

The Fruit Cases Act, which came into force in 1906, was the second measure passed for the exclusive benefit of the fruit industry in this State. Its chief purpose was to establish standard sizes for cases, in order that the then prevalent practice of selling fruits in packages of varying dimensions might be abolished, and a basis of value between seller and purchaser established. The imperial bushel capacity, viz., 2,218 cubic inches, was taken as a basis, and a schedule of sizes for cases was compiled. These sizes were fixed at half-bushel, one-bushel, and two-bushel capacities.

Fruit Cases Act has Proved Beneficial.

Much opposition to the introduction of the Act was shown by orchardists. It was contended that many of the growers would be put to great loss in getting rid of their old stocks of cases; that the compulsory branding of cases with the maker's name and guarantee would considerably add to the cost of cases, and the grower be thereby penalized; that the enforcement of the Act would constitute a restriction of trade. These are only some of the objections raised, and so persistent was the opposition, which, by the way, consisted of a small but very energetic minority, that the application of the Act was delayed for eighteen months after it was passed. Finally, however, it came into full operation, and has remained so ever since—some ten or eleven years. None of the gloomy predictions regarding its baneful effects on the industry has been fulfilled. On the contrary, the benefits derived have become so obvious that no one would think of advocating a reversion to the old order.

Fruit Cases Act does not Provide a Complete Standard.

Although the Fruit Cases Act has proved of inestimable benefit to the community by insisting that certain fruits shall be sold only in standard-sized packages, yet it has failed to provide a complete basis of value between the seller and the purchaser. It insures only that, provided the package is properly filled, a purchaser receives a bushel (a capacity bushel, it must be remembered) of fruit for his money, but with no guarantee as to the quality of such fruit. As a matter of fact, the utility of the capacity standard as giving the best basis of value is becoming discredited amongst the more advanced sections of the industry. The reason for this attitude will be more fully stated later.

Victoria the First State to Introduce Legislation Governing Sizes of Cases.

Victoria was the first Australian State to introduce a Fruit Cases Act, and shortly after the other States fell into line. Unfortunately, however, some of the sizes adopted by the other States differed from the sizes specified in the Victorian Act, or, rather, in some instances their legislation went further, and provided for cases of dimensions which were not included in our Act. In New South Wales and Queensland

sizes were fixed for cases suitable for the packing of citrus fruits, which constitute the main crop of those States. The "dump" bushel case included in the Victorian Act differed in size from the "dump" case in use in Tasmania, which is known in the trade as the "Peacock" case.

Sizes of Cases now Uniform Throughout the Eastern States.

These matters were adjusted at an Inter-State Conference of Ministers of Agriculture, held in Tasmania in 1913, at which all the States excepting Western Australia were represented. A schedule of cases of uniform sizes for all the States which were represented at the Conference was adopted, and these are included in the Victorian Fruit Act regulations, which came into force this year.

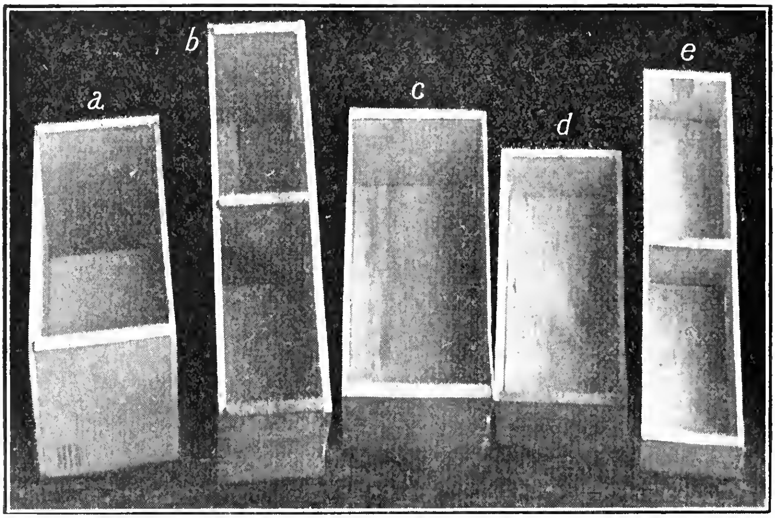


Plate III.

(*a*) "Peacock" Dump Case; (*b*) Flat Bushel Case; (*c*) "Special" or "Canadian" Case; (*d*) Half-bushel "Peacock" Dump Case; (*e*) Half-bushel Flat Case.

DESCRIPTION OF CASES.

"Peacock" and "Flat" Bushel Cases.

These are shown in the illustrations accompanying this article, and a short description of each may perhaps be useful.

Plate III.(*a*) shows the "Peacock" dump case, which measures 18 inches long by $14\frac{1}{4}$ inches deep by $8\frac{2}{3}$ inches wide=cubical content of 2,223 cubic inches. This case is used for packing apples for oversea and Inter-State export, and also for local sale.

Plate III.(*b*) illustrates the "Flat" bushel case, measuring 26 inches long by $14\frac{1}{4}$ inches deep by 6 inches wide= cubical content of 2,223 cubic inches. This case is used locally for packing all kinds of fruit, and is one which is mainly used for selling apples in the open case at the Queen Victoria and other retail markets. For reasons which will be given subsequently, the writer considers this case unsuitable for packing apples.

Adapted "Canadian" Case.

Plate III.(*c*).—This is an adaptation of a case called in the United States of America the "Special" or "Canadian" case, altered in measurement to enable it to conform with the bushel standard of capacity. The "Special" or "Canadian" case itself measures 20 inches long by 10 inches deep by 11 inches wide=cubical content of 2,200 cubic inches, or 18 inches short of the bushel. The adapted case measures 20 inches long by 10 inches deep by $11\frac{1}{8}$ inches wide=cubical content of 2,225 cubic inches.

For purposes of packing apples under the diagonal numerical system it is doubtful if any material benefit will accrue from the alteration in size. It must be remembered that the fruit-growers of the United States and Canada, in adopting the 20 inches x 11 inches x 10 inches case had in view the packing of apples by number and not by the bushel. A comparison of the two will be made later, when it will be shown that for all practical purposes in connexion with buying and selling the numerical system possesses advantages over the capacity standard.

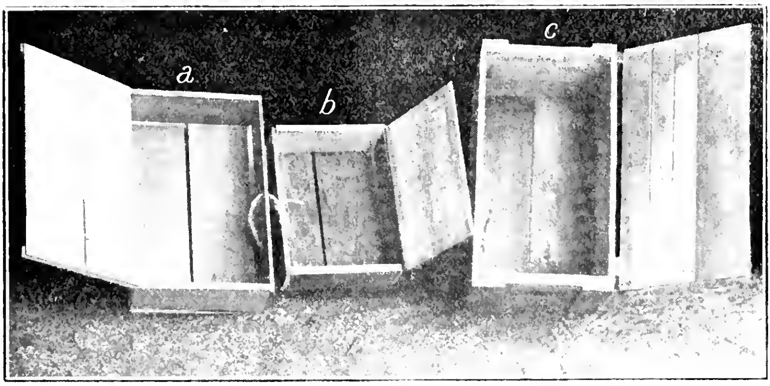


Plate IV.—"Gin" Cases.

(*a*) Half-bushel "Gin" Case; (*b*) Quarter-bushel "Gin" Case; (*c*) One-bushel "Gin" Case.

Half-Bushel Cases.

Plate III.(*d*) shows the half-bushel "Peacock" dump, and Plate III.(*e*) the half-bushel "Flat" case. Each of these is the same length as the full bushel case, but only one-half the depth, and therefore one-half the capacity.

Gin Cases.

Plate IV.(*a*) illustrates a one-half bushel "gin" case, Plate IV.(*b*) a one-quarter bushel "gin," and Plate IV.(*c*) a bushel "gin." The first of these measures 18 inches long by $11\frac{3}{4}$ inches wide by $5\frac{1}{4}$ inches deep=cubical content of 1,110 cubic inches. The quarter-bushel gin case measures $13\frac{3}{4}$ inches long by $10\frac{1}{8}$ inches wide by 4 inches deep=cubical content of $556\frac{7}{8}$ cubic inches. The bushel "gin" case measures 20 inches long by $11\frac{1}{8}$ inches wide, by 10 inches deep. These cases are usually closed, as shown in the illustration, by a lid having leather hinges, and are fastened by a

tie consisting of a short piece of rope or other suitable material. The fastening is usually supplemented by four or more nails in the usual manner for securing the lids of fruit cases. This type of case is largely used by growers in New South Wales and Queensland for packing choice oranges, mandarins, and passion fruit, and may be recommended for this purpose, and also for packing peaches, as it is easily packed and fastened, and is suitable for transporting soft fruits, and is easily handled.

Grape Cases.

Plate V.(*a*) and (*b*) show grape cases, which are recommended for use in packing grapes for export. The first case, which, when packed, holds about 28 lbs. of grapes, measures $22\frac{1}{2}$ inches long by 7 inches wide by $13\frac{1}{2}$ inches deep=cubical content of $2{,}126\frac{1}{4}$ cubic inches. The second case (Plate IV.(*b*)) contains, when packed, about 25 lbs. of grapes, and measures $26\frac{1}{2}$ inches long by 5 inches wide by $13\frac{1}{2}$ inches deep = cubical content of $1{,}788\frac{3}{4}$ cubic inches. The 28-lb. case, being the easier to pack on account of its greater width and the easier to handle by reason of its shorter length, is recommended as the better of the two. So far, the use of these cases has been almost exclusively confined to the oversea export trade, but they are strongly recommended for use in the local and Inter-State trade. When used in the transport of grapes over long distances, the case is usually filled with cork dusk, which is shaken into the case until the spaces between the bunches are filled. This forms a pad which prevents bruising of the fruit, the quantity of cork dust required for the purpose being usually from $2\frac{1}{2}$ to 4 lbs.

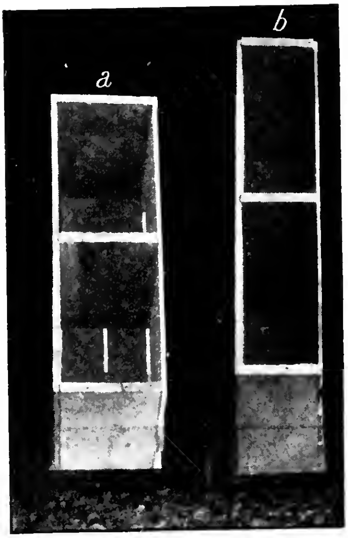


Plate V.

(*a*) Export Grape (28 lb.) Case;
(*b*) Export Grape (25 lb.) Case.

Trays for Soft Fruits.

Plate VI. illustrates trays used in the export of soft fruits, such as apricots, peaches, pears, and plums. These measure respectively 18 inches long by $14\frac{1}{4}$ inches wide by $3\frac{1}{4}$ inches deep=cubical content of $833\frac{5}{8}$ cubic inches; and 18 inches long by $14\frac{1}{4}$ inches wide by $2\frac{7}{8}$ inches deep=cubical content of 737 7-16 cubic inches. For oversea export each tray is lined with wood wool, and three trays are fastened together to form a package or "nest." The fastening is usually effected by nailing two strips of wood at each end of the "nest." These serve to cleat firmly together the three trays, which comprise the "nest." Another method is to pass around the nest near each end a strip of hoop-iron, which is strained and then nailed on. The illustration shows one of these trays packed singly, and also three such trays hoop-ironed together to form the "nest." A full description of the packing, branding, and fastening of all the packages mentioned, together with illustrations of same, will be supplied later.

Punnet and Bucket used for "Berry" Fruits.

Plate VII.(*a*) exemplifies a punnet used for retail sale of "berry" fruits (strawberries, raspberries, loganberries, &c.). It contains one and a half imperial pints.

Plate V.(*b*) shows a bucket used for containing "berry" fruits, and has a cubical capacity of two imperial gallons.

"TOPPING" ACT.

After the Fruit Cases Act had been in force for some time, its shortcomings in the direction of providing a proper basis of value were recognised, and an attempt to overcome these was made by the introduction of the Fruit and Vegetable Packing and Sale (Topping) Act in 1913.

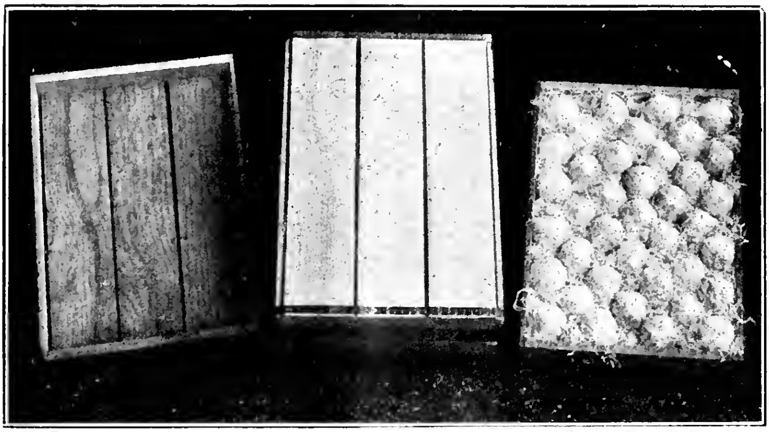


Plate VI.—Trays for Soft Fruits.

Chief Provisions of "Topping" Act.

This was a very simple measure, the chief section of which provided that no person should sell any fruit or vegetables contained in any package, or any lot of loose fruit or vegetables, unless the faced or shown surface of the fruit or vegetables in the package or lot was so packed, disposed, or arranged that the faced or shown surface of the fruit or vegetables was a true indication of the whole of the fruit or vegetables contained in such package or comprised in such lots. This was a step in the right direction, but as was the case when the Fruit Cases Act was introduced, the "Topping" Act met with opposition from many people engaged in the industry, especially from that section which retailed fruit in open cases in the metropolitan markets.

Shortcomings of "Topping" Act.

The "Topping" Act has proved very useful in eliminating many abuses from the fruit trade, but has been quite inadequate to provide

a selling standard of value, as, even when fruit is packed so that the faced or shown surface is a true indication of the sizes, degrees of maturity, and soundness of the whole of the fruit in the package, very little guidance is given to the purchaser as to its value for the purposes of re-sale.

Sale of Fruit in Closed and Open Packages.

This is particularly so when fruit is contained in a nailed up package, but even when sold in a package with the lid or side removed, the difficulty to assess the value still obtains, though in a lesser degree. It would perhaps be nearer the mark to say that, without standardized grading for colour, size, and soundness, and the marking of cases in conformity therewith, it is impossible to accurately gauge the value of a closed case of fruit, and is almost impossible to do so even when the lid or side of the case is removed. Under such conditions a wholesale purchaser who buys, say, a line of 100 cases of apples is compelled to open a large percentage of these, and even then, after all his trouble and loss of time, has little more than a vague idea as to whether he is receiving

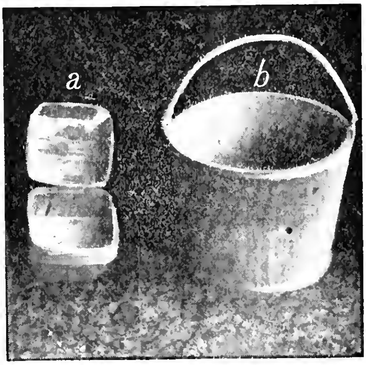


Plate VII.

(*a*) Punnet used for berry fruits; (*b*) Bucket used for berry fruits.

full value for his money. The retailer who buys in the market labours under the same disability, and is compelled to waste much valuable time in overhauling the fruit offered for sale before he can decide upon a purchase. The seller, too, often suffers, as, if the intending purchaser, when inspecting a case of fruit, discovers that it contains specimens of varying sizes, colour, and soundness, he is naturally prone to magnify the defects and assess the value of the whole case of fruit on the basis of the worst specimens. Most of the difficulties mentioned may be overcome by adopting the principle of packing according to standards which embrace colour, shape, size, soundness, variety, and freedom from disease.

These have all been provided for in the Fruit Act regulations, which came into force on 15th May, 1918. A short description of the provisions of the Act and regulations will be given in a subsequent article.

(*To be continued.*)

NATIVE FIBRE PLANTS.

By Alfred J. Ewart, D.Sc., Ph.D., Government Botanist.

As the term "fibre plant" has been used in a misleading sense,* it may be as well to define it more exactly. Fibres are as much an essential part of the structure of a flowering plant as bones are of a vertebrate animal, so that a list of the fibre plants of Victoria would be merely a list of the flowering plants of Victoria, and would include the ferns and their allies also. The term can, however, be restricted so as to include only those plants whose fibres have been proved to have a definite commercial value as sources of fibre. From this point of view no plants native to Victoria have become recognised fibre plants. A number of the more promising were tested by Mr. Guilfoyle and others many years ago and the fibres extracted, but none of them has been able to displace any of the recognised sources of fibres. To be able to do this, a new fibre plant must satisfy various conditions, which may be detailed as follows:—

1. Its fibres must be easily capable of separation and purification.
2. They must be equal or superior in strength, length, and quality to the class of fibre with which they have to compete.
3. They must be present either in unlimited quantity, or must come from plants which are capable of cultivation.

The exploitation of a fibre plant means a factory, and a factory cannot be dependent upon a precarious or quickly exhausted supply of a wild plant. If the fibre of the latter is sufficiently valuable commercially, the plant is worth cultivating to secure a constant supply, and it must then compete with easily cultivable plants, such as flax, &c. Further, in a country where thousands of tons of straw are burnt annually, not out of wastefulness, but because the price obtainable for the whole yield would not cover the cost of collection and transportation, there is no need to search among wild plants for materials for strawboard or coarse paper pulp.

The plant fibres of use commercially fall into three main classes. There are, firstly, the fibres termed "pappus," which are hairs growing usually from seeds enclosed in pods (cotton, kapok, &c.). No native plant shows any likelihood of being able to displace any of the plants recognised as sources of this type of fibre. The combination of strength, length, and purity in the cotton fibre is unique among plants.

In the second class of fibre plants, the fibres belong to what is termed sclerenchyma tissue, and in Dicotyledons they occur just outside the vascular bundles (veins) in a herb, or in the bark outside the wood in a tree. In Monocotyledons, however, the fibres are usually associated with the vascular bundles which are scattered all through the stem or leaf, and do not occur on the outside of the stem only. As a general rule, therefore, in Dicotyledons this class of fibre is more easily obtained in pure form than in Monocotyledons, where it is associated with the wood tissue and soft, weak, easily decomposed phlöem tissue of the vascular bundle. The finer fibres of

* *Journal of Agriculture*, October, 1918, p. 600, "Indigenous Fibrous Plants of Victoria."

this type are, therefore, obtained from Dicotyledons (flax, hemp, jute), for the most part. Monocotyledons yield coarser, weaker, darker, or more irregular and rougher fibres of less commercial value (coir, raffia). New Zealand flax (*Phormium tenax*) is one of the few exceptions, but is at a disadvantage owing to its slow growth under cultivation.

The third class of fibre is derived from the fibres of wood tissue, and, as a general rule, is employed only for making paper pulp, but has been used in various ways in Germany for weaving to make good the deficiency of proper textile fibres. For wood pulp the fibres should be at least 1 to 4 millimetres long, they must be easily separated by mechanical or chemical treatment, and must, therefore, not be too strongly cemented together, and the less lignified the fibres are, and the more they consist of unaltered cellulose, the better.

Bearing the above facts in mind, it may be worth while to consider how far the native plants which have been put forward as fibre plants comply with the above conditions and requirements as possible commercial sources of fibre.

Eucalyptus Barks as Fibre-yielding Barks for Paper Making.—The first statements to this effect appear to have been made some 30 years ago by Baron von Mueller, and apparently were intended as statements of possibility rather than as statements of fact. Since then, owing to the increased use of wood pulp for paper making, many once promising materials have lost all value for this purpose. The original statements have, however, been repeated again and again more and more dogmatically without further investigation of the actual economic value of such materials.

In some respects the barks of Eucalypts have precisely those qualities which should not be present in good paper-pulp materials. Thus the presence of insoluble gum, resin, or kino, or of a high percentage of tannin or colouring materials is a serious disqualification for paper-pulp purposes. The pulp must be capable of ready bleaching without treatment so severe as to damage the fibres, lessen their strength, or cause their walls to swell. Finally, the bark must not contain suberinized tissue mixed up with the fibres, as is the case with the stringy barks. The suberinized tissue is more resistant than the fibres to caustic soda and retting, and can only be removed even partially by expensive mechanical methods. Until it is removed, a satisfactory pulp cannot be obtained.

Statements as to the value of the barks of Eucalypts for paper making should, therefore, be received with great caution, unless definite evidence is given of the actual manufacture, cost, and quality of the paper supposed to be yielded by them.

Eucalyptus obliqua.—The bark is stated to be suitable for the manufacture of packing, printing, or even writing paper, as well as for mill and paste boards, and the pulp is stated to bleach readily. As a matter of fact, the fibres are red or brown in colour, are very weak, and cannot be bleached readily by any cheap method without still further weakening them. As the bark contains large amounts of suberinized non-fibrous tissue, it is unsuitable for paper making. The same applies to *Eucalyptus macrorrhyncha,* the red stringy bark.

The barks of *E. globulus, E. amygdalina, E. goniocalyx, E. corymbosa. E. longifolia, E. stuartiana,* and *E. rostrata* are also stated to be useful in or suitable for paper making. I have not been able to procure any samples of paper made from these barks, nor can I find any data as to the cost and value of paper prepared from them. They all appear to have one or more disqualifications as economically valuable sources of paper-making materials, and hence, until precise information in regard to them can be brought forward, including cost of treatment and value of product, they can be dismissed from the list of materials suitable for paper making.

Acacia penninervis (the hickory wattle).—The bark of this plant is stated to be suitable for making coarse paper, and that of other species for packing paper. I cannot find any record of paper having been made from the bark of this tree, and in general barks which are at all rich in tannin are unsuitable for paper pulp.

Melaleuca ericifolia (swamp paper bark).—The bark is stated to be adaptable for making blotting paper, and probably filter paper. The papery bark is very deceptive in appearance. It is non-fibrous and suberinized, and is, therefore, the worst possible material for either blotting paper or filter paper. Good blotting paper should consist of as pure as possible cellulose fibres. Lignified fibres are not so good. Suberinized tissue, being non-absorbent, is useless. As filter paper should be as nearly free from ash as possible, the bark of the paper tree is useless for filter paper on that account alone.

Brachychiton (kurrajong).—The barks of the different species of this tree yield a strong fibre. It is often cut down in drought time to feed stock, and hence is rapidly disappearing from Victoria. The fibre is worthy of investigation, but it would not be profitable to grow the tree for its bark alone.

Pimelea.—Various species of these are herbs or shrubs, with a very tough fibrous bark. Mr. Patton, Government Research Scholar, has isolated the fibres in some cases, and finds that they are of great length, and appear to be of considerable strength. They are worthy of further investigation, since the fibres are as long as short-staple cotton, but, unless the plants can be cheaply and economically cultivated, they are not likely to compete with such fibre plants as flax or cotton. The above, as well as *Plagianthus pulchellus* (the hemp bush), and *Commersonia Fraserii* (the blackfellow's hemp), were well known to the native aborigines as sources of fibre or cordage. So far, however, they have not been found to possess such special properties as would render them capable of displacing any of the recognised economic fibre plants.

Casuarina stricta (drooping sheoke) and *C. suberosa* (black buloke).—It has been stated that the foliage of these trees can be converted into an excellent pulp for packing paper, and even printing paper and millboards. The trees really have no foliage, for the leaves are reduced to minute scales. The branches are so formed that it is very doubtful whether paper pulp could be economically obtained from them. They contain two different kinds of fibres, requiring dissimilar treatment, and the two classes of fibre would be difficult to separate. Mr. Patton informs me that the fibres are among the smallest that he has examined.

Bedfordia salicina (the blanket wood) has been quoted as yielding a white flock resembling scoured wool from the under surface of the leaves, from which paper could be made. The cost of collecting such material would, of course, be prohibitive, and, as it consists of resistant cuticularized hairs, it would be useless for paper making.

Lavatera plebeja, or the Australian hollyock.—Samples of paper were made many years ago in England from the fibres of this plant, but it failed to compete successfully with other sources of paper materials. Fibres are never obtained by chopping up the material into small pieces. This breaks the fibres transversely to their length, and destroys their value. The methods must always be such as to give the greatest possible length of fibre, and when caustic soda is used, it is not to remove gummy matter, but to loosen the fibres from one another, and to enable the non-fibrous material to be washed away or removed without the fibres being broken or destroyed.

Urtica (nettle).—Owing to the shortage of supplies of more useful textile materials, Germany appears to have been compelled to make use of the fibre of the nettle. Linen made from nettle fibres appears to be very irritating to delicate skins, and with the Himalayan nettle the irritation produced is severe. If Germany has been cultivating the nettle for fibre purposes, some difficulty may be experienced in clearing the fields for ordinary agriculture when supplies of cotton and similar textile fibres are again available. So far as the Victorian nettles are concerned, there is no satisfactory evidence to show that they are likely to prove satisfactory sources of paper-making materials.

Rushes and Sedges.—Many of these have been recommended for paper making. A few have been tested in England, Europe, and America. It is very doubtful whether they can compete with wood pulp. The high percentage of silica is a disadvantage, and owing to their peculiar habit, they could hardly be brought under cultivation. The cost of collection when growing wild would be considerable, and they would need to have a higher intrinsic value than they appear actually to possess to make their commercial exploitation profitable. Several are suitable, and are used for weaving, but the amount so used will always be small.

Xanthorrhœa australis and *X. hastilis* (grass trees).—The leaves of these plants have been quoted as affording a very good fibre. The fibre is weak and brittle, and the cost and difficulty of its extraction puts the plant out of the field as a commercial source of fibre.

Poa cæspitosa.—The tufted meadow grass has been recommended as affording a good fibre of fair quality, and making a fair paper stock. Some years ago, Mr. Holden, then Chairman of the Geelong Harbor Commission, who was interested in the utilization of native plants, obtained for me bulk samples of *Poa cæspitosa*. They were forwarded to the United States for testing. The plant proved to be useless as a fibre or paper plant and even for weaving the value of the material in America was insufficient to pay for the cost of collection and transport and leave any profit. This was disappointing, as the material appeared to be promising, but this instance is sufficient to show the caution necessary in judging the economic value of a native "fibre" from casual examination without making full tests on a profit and loss basis.

DOES POULTRY FARMING PAY?

By A. V. D. Rintoul, Assistant Poultry Expert.

The fact that this question has appeared at some time or other in most poultry journals published in every corner of the globe is, of itself, sufficient reason why a careful analysis of the prospects of the industry is, at this crisis in the world's history, eminently desirable. Primary production must form the basis of our future success, and no nation can afford to neglect any branch of the rural industries in which profits may accrue.

It is desirable, in the first instance, to determine what is actually meant by the term "Poultry farming." The main source of income undoubtedly should be derived from the production of eggs for commercial purposes, and while this end is being achieved considerable profits may at times be made by those meeting the requirements of certain branches of the industry, but these side-lines must remain permanently subsidiary to the determining point—Does egg production pay? Failures must be accounted for more fully than successes require to be. Considerably more than a competence is gained by those engaged in the following branches:—Stud breeding (which includes the sale of baby chicks, &c.), custom hatching, the sale of proprietary foodstuffs, the manufacture of articles of equipment, such as incubators, brooders, and the like, literary work in connexion with the industry, and lastly—though none too remunerative—instructional and advisory work. All these sources of income are, however, in the long run dependent upon the success or otherwise of the endeavour to produce commercial eggs profitably. Failures are all too frequent, and their causes and methods of prevention are therefore entitled to a close analysis.

Failures are almost invariably due to one or more of the following causes:—First and most important, *lack of experience;* second, *lack of capital;* third, *lack of health;* and a fourth cause may be added, lack of aptitude for the business. Quite recently a well-known institution desired to have one in whom it was interested started in poultry keeping, largely on the ground that the mentality of the individual concerned was too low to permit him to take up any other work. No greater mistake could be made than to consider poultry keeping the proper outlet for the fool of the family. Apart from the aptitude to carry on any commercial undertaking successfully, there is required an ingrained love of live stock with the ability to get the best return from them, besides a general knowledge of food values, building construction, bookkeeping, and banking, together with some elementary anatomical and medical experience.

Lack of experience in any of these matters may prove the poultry-keeper's undoing, yet, fired with enthusiasm, which is perhaps a polite way of expressing "through foolhardiness," the beginner rushes in, and may be, owing to the blandishments of some agent, buys land in an unfavorable situation, proceeds to erect unsuitable housing, acquires stock from an undesirable breeder, or makes a start at the wrong time of the year. Failure results, but this does not mean that the query, "Does poultry farming pay?" is to be answered in the negative.

Lack of capital is the next barrier to success. The land may be suitable, the shedding correct, the stock of high quality, but the available funds are insufficient to tide over the necessary period until enough stock come into full lay at the right time of year to more than balance the ledger. This want of sufficient capital also prevents the best being got from the undertaking, as suitable lines of foodstuffs cannot be purchased under the best market conditions; young cockerels are sold too soon owing to the lack of capital for foodstuffs, or in consequence of insufficient shed accommodation to enable them to be held pending the time of most advantageous marketing; eggs have to be disposed of for cash as laid instead of being held in cool store until the dearer time of year.

Lack of health is perhaps the most tragic cause of failure, those who are compelled on this account to lead an out-door life finding that at certain times of the year the work is more arduous than they are, by nature of their ailment, able to perform.

We now arrive at the point where the question can be put—Given sufficient experience, the necessary capital, and good personal health, does poultry farming pay? To this there can be only the one answer, "Yes, it undoubtedly does." As to how the capital and good health may be acquired is not a direct concern of the Department of Agriculture, but the necessary experience can undoubtedly be gained by spending at least six months, and preferably a year, at some place where the business is already being made a success, and, unless a business is a success commercially, there is some element of doubt as to which is actually meant by the term "taking in" students.

What Profits can be made.

On this point there is a wide divergence of opinion, and because a certain profit per head can be made from 20, or even 200, birds, it by no means necessarily follows that proportionate results will be obtained from 2,000 or 20,000 birds. Estimates are almost invariably based on the returns from the sale of eggs, less the cost of feed, more or less neglecting the rental value of the land, interest and depreciation on buildings and equipment, and the labour involved.

A careful study of the egg-laying competitions during the past few years reveals the fact that it is possible to get a return of seventeen dozen (204) eggs per bird in a period of twelve months from 600 or more pullets, and that these eggs are worth, on an average, 1s. 2d. per dozen all the year round, so that the competition income per bird may be stated, roughly, at 19s. 4d., against an average cost of feed—in war time—of about 9s. 4d. Consequently, the competition profit over feed has been about 10s. per head, but it would be fatal to consider such return as net profit on a commercial plant. Whatever may be the circumstances of the selection of competition birds, they undoubtedly are considered at the time to be the pick of the flock, and not representing the general average. Further, no account is taken of the cost of rearing a pullet up to the time she arrives at the competition, from which it may be seen that an estimate of 20s. profit over the feed bill *for the laying year* for every three pullets, *i.e.*, 6s. 8d. each, is much more nearly correct than to foolishly expect 10s. per bird. Even this

6s. 8d. per bird, however, is not net profit, because the cost of rearing to the laying stage usually exceeds the market value of the light-breed birth after her laying year, and no allowance has been made for interest on capital expended on house, land, shedding, and equipment, nor, in the case of light breeds, for the cockerels, which at times fail to realize the actual expenditure upon them. Probably, therefore, it is much more reasonable to assess the real profits at 5s. per bird over the entire flock.

This estimate will eventually prove of greater value to the industry than any higher one that could be made, as it should not only act as a wholesome check upon the inexperienced speculator, who is easily carried away by incorrectly worded pamphlets, but also act as an inducement to every one to keep, at least, a few fowls, if only for the profitable nature of this undertaking. The suburban dweller using household scraps can materially reduce the feed bill thereby, and no farm should ever be considered complete without, at least, 100 or 150 fowls. There are a large number of suburban homes which are actually being paid for by the profits made from poultry, while the wages earned are meeting household expenses.

When the United States of America declared war, the sum of £30,000 was at once appropriated for itinerant lecturers to develop the poultry industry alone, which was then worth £140,000,000 per year, or, roughly, 28s. per head of population. In Victoria, the industry is worth about £2,146,000, or, roughly, 30s. per head of the population, and the expenses connected with the industry have been drastically curtailed since the war.

(*To be continued.*)

Eczema in farm horses is a non-parasitic disease of the true skin, caused by pressure or chafing of saddle or harness, especially at the time of change of coat; extremes of heat or cold, exposure to wet, want of cleanliness, bad feeding, and constitutional disturbance. These produce inflammation of the underskin or dermis, as distinguished from the outer skin or epidermis. The symptoms are small nodules on which the hair stands upright and becomes knotted; scabs form, which become detached, and leave bare patches; the irritation is great, and rubbing makes it worse. Eczema may attack the mane or tail, while grease and mud fever are simply forms of the same disease. The scabs should be softened with glycerine, then washed with warm water and hard soap. After drying thoroughly, a lotion composed of one part each of lead acetate and zinc sulphate in 40 parts of water should be applied. If this does not cause a change, an application of oil of tar is recommended by a veterinary surgeon. A change of food and provision for shelter should be made. As the system is generally out of order, a ball should be given and followed up by soda hyposulphite ½ oz. twice a day. If the system is badly deranged, Fowler's solution of arsenic, 2 to 8 drams, may be given, and sulphur, 2 oz. to 4oz., added to mash of gruel once a day. The horse should be kept clean during treatment by grooming.—*The Australasian.*

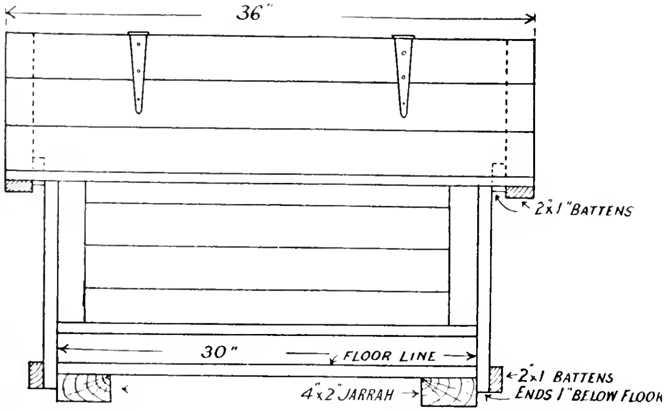
AUTOMATIC FEEDERS FOR PIGS.

R. T. Archer, Senior Dairy Inspector.

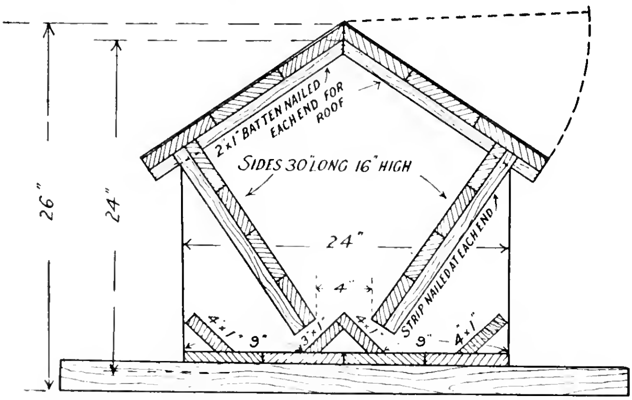
The illustrations on the next page show two self-feeders for pigs. The feeder is 30 inches long, 24 inches wide, and 26 inches from the peak of the roof to the ground. One-inch hardwood boards should be used, except for two sleepers of jarrah, 2 by 4 inches, placed beneath to prevent the feeder being upset, and to keep it off the ground. Ends, sides, floor, and roof can be made separately and pieced together. Each roof slope is 36 inches by 18 inches. For a slope three 6-in. by 1-in. boards 3 feet long are held together by nailing 2-in by 1-in. strips 18 inches long across each end. The ends are 24 inches wide, 16 inches high at each side, and 24 inches high at the peak. Take 6-in. by 1-in. boards 2 feet long, nail a 2-ft. strip 2 inches by 1 inch 2 feet long, nail a 2-ft. strip 2 inches by 1 inch across one end, and another across the boards 16 inches higher. Measure 24 inches in the middle and 16 inches on each side from the end with the strip. Draw a line from the 16-in. mark on each side to the 24-in. mark in the middle, and saw along these lines to make the ends the proper shape. The sides are 30 inches long and 16 inches high. For each side take four 4-in. by 1-in. hardwood 30 inches long and nail a 2-in. by 1-in. strip across each end. The floor is 24 inches wide and 30 inches long, and may be made by nailing four 6-in. by 1-in. boards, or six 4-in. by 1-in. boards 30 inches long to the 4-in. by 2-in. sleepers. These sleepers should be at the ends, so that the ends of the feeder may be nailed to them, and they should project 9 inches on each side. When everything is ready to be put together except the peak in the floor and the sides of the troughs, put the floor peak in. This is 30 inches long, and is made by nailing together 4-in. by 1-in. and 3-in. by 1-in. boards, trimming the edges to meet the floor, and nailing to the floor with each edge 9 inches from the sides. This will put the peak in the middle. Then attach both ends, running the lower end an inch below the flooring, and nailing to the sleepers flooring and peak. Next nail the sides between the ends, standing them in from the upper outer edge of the ends towards the middle of the floor, thus leaving a space between the sides of the floor and floor peak for the mixture to feed through. Nail 4-in. by 1-in. boards 30 inches long to the floor and ends, planing the lower edges to fit the floor, for the sides of the trough. The roof, which should be covered with some waterproof material, is put on last. After the edges have been planed to fit properly at the peak, one slope is nailed down, and the other is hinged to it.

Of course, the feeder may be made longer than specified above, and otherwise altered to suit circumstances.

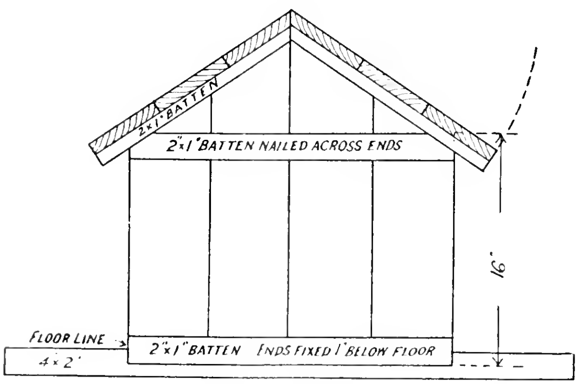
Another cheap and convenient form of automatic feeder is a barrel as shown on page 756. The illustration does not require much explanation. The outlet holes may be made on four sides, and the size varied according to requirements. The pyramid or cone causes the grain to run out more freely and completely. Three-inch by 2-inch hardwood boards might be nailed to the platform a foot or so away from the barrel, so as to prevent the food spreading too much.



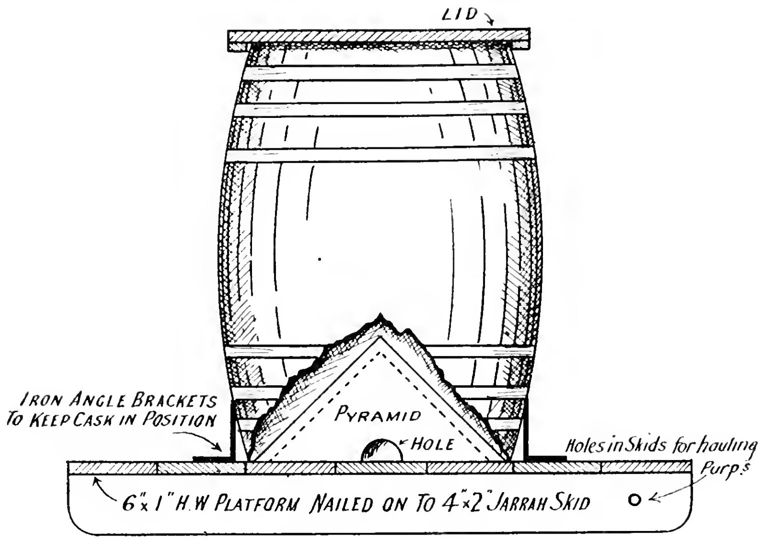
SIDE VIEW



CROSS SECTION



END VIEW



A Barrel on A Platform With A Pyramid in the bottom To slide the Grain to openings cut in 3 or 4 sides of the Barrel

HEALTH VALUE OF CHEESE.

The long-cherished idea that cheese should form only a small part of the daily diet has recently been challenged. Not long ago the United States Department of Agriculture issued a bulletin recommending the use of cheese as a cheap and wholesome substitute for meat.

Now we are told by a Swiss investigator that cheese is valuable not only for its content of proteids and carbohydrates, but for the beneficial bacteria found in it.

Another interesting and important assertion is to the effect that persons who make cheese a considerable part of their regular diet are very resistant to many intestinal diseases, such as dysentery, and the dreaded typhus fever which has desolated Servia. According to Dr. Burri, the daily meat ration in the Swiss army has already been partly replaced by cheese, with excellent results.

—*Producers' Review*, N.Z.

Fertilizers Act 1915.

LIST SHOWING RESULTS OF ANALYSIS OF SAMPLES OF ARTIFICIAL FERTILIZERS COLLECTED IN VICTORIA (SEASON 1917–18) UNDER THE PROVISIONS OF SECTIONS 16 AND 17 OF THE FERTILIZERS ACT 1915 (No. 2652.)

Label No.	Description of Manure.	Manufacturer or Importer.	Nitrogen.		Phosphoric Acid.								Price asked for the Manure per Ton.	Value of the Manure per Ton calculated on result of Analysis.	District in which Sample was Obtained.
					Water Soluble.		Citrate Soluble.		Citrate Insoluble.		Total.				
			Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.			
			%	%	%	%	%	%	%	%	%	%	£ s. d.	£ s. d.	
993	Mt. Lyell No. 1 Superphosphate	Mt Lyell Mining and Railway Co. Ltd.	..	..	17·75	17·00	0·66	0·50	0·95	0·50	19·39	18·00	5 4 11	5 0 0	Metropolitan
994	Sickle Florida Superphosphate	Cuming, Smith, and Co. Pty. Ltd.	..	..	17·64	17·00	0·45	0·50	0·57	0·50	18·66	18·00	5 2 9	5 0 0	,,
996	Wischer's No. 1 Superphosphate	Wischer and Co. Pty. Ltd.	..	..	17·49	17·00	0·30	0·50	0·66	0·50	18·45	18·00	5 1 2	5 0 0	,,
997	Sickle Market Garden Manure	Cuming, Smith, and Co. Pty. Ltd.	3·67 (0·89)	4·00 (1·00)	7·71	7·65	1·04	0·22	3·39	2·32	12·14	10·19	5 19 8	7 0 0	,,
1300	Wischer's Superphosphate and Bone No. 2	Wischer and Co. Pty. Ltd.	1·09	0·75	12·99	12·75	1·21	1·13	2·06	3·62	16·26	17·50	5 3 3	5 15 0	Geelong
1301	Wischer's Superphosphate and Bone No. 1	,, ,, ,,	1·41	1·50	10·42	8·50	2·76	3·25	4·55	5·25	17·73	17·00	5 10 1	6 10 0	,,
1302	,, ,, ,, ,,	,, ,, ,,	1·54	1·50	11·22	8·50	2·36	3·25	3·19	5·25	16·77	17·00	5 9 8	6 10 0	,,
1303	Sickle Florida Superphosphate	Cuming, Smith, and Co. Pty. Ltd.	..	..	16·61	17·00	1·17	0·50	0·44	0·50	18·22	18·00	5 0 5	5 0 0	Shepparton
1304	Sickle Market Garden Manure	,, ,, ,,	4·42 (1·84)	4·00 (1·00)	8·00	7·65	2·68	0·22	2·32	2·32	13·00	10·19	7 1 4	7 0 0	,,
1305	Sickle Florida Superphosphate	,, ,, ,,	..	..	17·32	17·00	0·88	0·50	0·50	0·50	18·70	18·00	5 3 1	5 0 0	,,
1307	Mt. Lyell No.1 Superphosphate	Mt. Lyell Mining and Railway Co. Ltd.	..	..	18·71	17·00	0·37	0·50	0·65	0·50	19·73	18·00	5 8 6	5 0 0	,,
1308	Mt. Clear Dried Blood ..	Bailey Bros., Ballarat ..	10·87	10·00	..	..	..	..	..	..	..	..	10 17 5	12 10 0	Mildura
1309	Ammonium Sulphate ..	Mildura Co-operative Fruit Co.	20·50	20·56	..	..	..	..	..	..	..	..	19 19 5	20 12 6	,,
1310	Mt. Lyell No. 1 Superphosphate	Mt. Lyell Mining and Railway Co. Ltd.	..	..	18·10	17·00	0·42	0·50	0·88	0·50	19·40	18·00	5 5 6	5 0 0	,,
1311	Mt. Lyell Special Mixture ..	,, ,, ,,	(2·90)	(2·40)	13·15	13·60	1·05	0·40	0·77	0·40	14·97	14·40	12 3 0	Not ascertained	,,
1312	Mt. Lyell Market Garden Manure	,, ,, ,,	4·36 (1·24)	4·00 (1·00)	8·81	7·65	1·90	0·22	1·24	2·32	11·95	10·19	6 14 9	7 0 0	,,
1313	Wischer's Superphosphate and Bone No. 1	Wischer and Co. Pty. Ltd.	1·65	1·50	7·25	8·50	2·84	3·25	4·51	5·25	14·60	17·00	4 15 9	6 10 0	,,

Figures in parentheses represent nitrogen as ammonia.

LIST SHOWING RESULTS OF ANALYSIS OF SAMPLES OF ARTIFICIAL FERTILIZERS COLLECTED IN VICTORIA (SEASON 1917-18) UNDER THE PROVISIONS OF SECTION 16 AND 17 OF THE FERTILIZERS ACT 1915 (No. 2652)—*continued.*

Label No.	Description of Manure.	Manufacturer or Importer.	Nitrogen.		Phosphoric Acid.								Price asked for the Manure per Ton.	Value of the Manure per Ton calculated on result of Analysis.	District in which Sample was Obtained.
					Water Soluble.		Citrate Soluble.		Citrate Insoluble.		Total.				
			Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.			
			%	%	%	%	%	%	%	%	%	%	£ s. d.	£ s. d.	
1318	Sickle Florida Superphosphate	Cuming, Smith, and Co. Pty. Ltd.	..	..	18·10	17·00	0·68	0·50	0·47	0·50	19·25	18·00	5 6 6	5 0 0	Benalla
1320	Mt. Lyell Superphosphate and Bone No. 2	Mt. Lyell Mining and Railway Co. Ltd.	0·64	0·75	12·36	12·75	1·36	1·38	3·01	3·37	16·76	17·50	4 17 1	5 15 0	Shepparton
1315	Wischer's Superphosphate and Bone No. 2	Wischer and Co. Pty. Ltd.	0·95	0·75	10·67	12·75	2·40	1·13	2·17	3·62	15·24	17·50	4 14 3	5 15 0	Rochester
1316	Wischer's No. 1 Superphosphate	,, ,, ,,	..	..	16·40	17·00	0·84	0·50	1·96	0·50	19·20	18·00	4 19 2	5 0 0	,,
1324	Echuca Bone Fertilizer ..	W. G. Boyle, Echuca ..	3·50	4·75	..	..	8·28	8·25	11·25	6·75	19·53	15·00	6 13 4	6 10 0	Echuca
1326	Sickle Florida Superphosphate	Cuming, Smith, and Co. Pty. Ltd.	..	..	17·60	17·00	0·66	0·50	0·74	0·50	19·00	18·00	5 4 0	5 0 0	Rochester
1327	Sickle Bone and Superphosphate, Mixed (A)	,, ,, ,,	1·55	1·50	11·50	8·50	3·00	3·25	2·95	5·25	17·45	17·00	5 13 9	6 10 0	,,
1518	Wischer's Superphosphate and Bone No. 1	Wischer and Co. Pty. Ltd.	1·28	1·50	10·79	8·50	1·49	3·25	4·65	5·25	16·93	17·00	5 4 1	6 10 0	Metropolitan
1524	Mt. Lyell No. 1 Superphosphate	Mt. Lyell Mining and Railway Co. Ltd.	..	..	17·38	17·00	0·55	0·50	1·26	0·50	19·19	17·00	5 2 6	5 0 0	,,
1525	Wischer's Superphosphate No. 1	Wischer and Co. Pty. Ltd.	..	..	16·11	17·00	0·59	0·50	0·94	0·50	17·64	17·00	4 15 4	5 0 0	,,
1526	Mt. Lyell Bone and Superphosphate No. 1	Mt. Lyell Mining and Railway Co. Ltd.	1·66	1·50	9·37	8·50	1·91	3·25	5·86	5·25	17·14	17·00	5 8 0	6 10 0	,,
1527	Sickle Florida Superphosphate	Cuming, Smith, and Co. Pty. Ltd.	..	..	17·19	17·00	0·43	0·50	0·70	0·50	18·32	17·00	5 0 3	5 0 0	,,
1528	Sickle Nitro-Superphosphate ..	,, ,, ,,	2·00 (1·51)	2·00 (1·50)	13·18	13·00	0·38	0·39	1·12	1·61	14·68	15·00	5 16 6	6 15 0	,,
1530	Star Brand Blood and Bone Manure	Reynolds Bros., Moorabbin	6·44	5·50	..	..	4·31	6·36	9·45	7·03	13·76	13·39	8 7 4	10 0 0	,,
1531	Sickle Superphosphate and Bone Mixed (C)	Cuming, Smith, and Co. Pty. Ltd.	0·77	0·75	15·08	12·75	2·11	1·37	1·51	3·38	18·70	17·50	5 12 9	5 15 0	,,
1533	Sickle Florida Superphosphate	,, ,, ,,	..	..	18·40	17·00	0·53	0·50	0·62	0·50	19·55	18·00	5 7 5	5 0 0	,,
1534	Cockbill's Bone Fertilizer ..	John Cockbill ..	4·16	3·50	..	..	2·89	3·50	14·32	14·75	17·21	18·25	6 6 11	7 0 0	,,

Figures in parentheses represent nitrogen as ammonia.

List Showing Results of Analysis of Samples of Artificial Fertilizers Collected in Victoria (Season 1917–18) under the Provisions of Sections 16 and 17 of the Fertilizers Act 1915 (No. 2652)—*continued.*

Label No.	Description of Manure.	Manufacturer or Importer	Nitrogen. Found.	Nitrogen. Guaranteed.	Phosphoric Acid. Water Soluble. Found.	Water Soluble. Guaranteed.	Citrate Soluble. Found	Citrate Soluble. Guaranteed.	Citrate Insoluble Found.	Citrate Insoluble Guaranteed.	Total. Found.	Total. Guaranteed.	Price asked for the Manure per Ton.	Value of the Manure per Ton calculated on result of Analysis.	District in which Sample was Obtained.
			%	%	%	%	%	%	%	%	%	%	£ s. d.	£ s. d.	
1535	Mt. Lyell Market Garden Manure	Mt. Lyell Mining and Railway Co. Ltd.	3·69 (1·02)	4·00 (1·00)	6·67	7·65	1·10	0·22	7·24	2·32	15·21	10·19	6 9 8	7 0 0	Bendigo
1536	Rohs' Bonedust*	P. Rohs Pty. Ltd., Bendigo	4·90	4·00	..	..	..	..	..	..	21·21	18·00	8 2 4	7 0 0	,,
1537	Rohs' Bonedust and Blood, Mixed	,, ,, ,,	6·93	6·00	..	..	4·20	6·50	7·98	5·00	12·18	11·50	8 10 2	8 10 0	,,
1538	J. N. Day's Bonedust† ..	J. N. Day, Benidgo ..	4·18	4·00	..	..	..	..	..	..	18·86	18·00	6 8 7	6 15 0	,,
1539	Mt. Lyell No. 1 Superphosphate	Mt. Lyell Mining and Railway Co. Ltd.	..	..	18·95	17·00	0·54	0·50	0·49	0·50	19·98	18·00	5 10 7	5 0 0	,,
1540	Rohs' Bonedust and Superphosphate, Mixed	P. Rohs Pty. Ltd., Bendigo	2·87	1·50	7·21	8·50	4·80	5·25	8·78	4·25	20·79	18·00	6 18 7	6 10 0	,,
1542	Ark Bone Fertilizer	Arthur Murphy, Ararat	3·77	3·50	..	..	3·01	3·98	15·63	12·90	18·64	16·88	6 6 4	6 10 0	Ararat
1543	Lighthouse Fertilizer ..	Thos. Borthwick and Sons, Portland	5·13	4·50	..	..	2·72	3·00	10·22	8·00	12·94	11·00	6 6 4	7 0 0	Portland
1544	Sickle Superphosphate and Bone (C)	Cuming, Smith, and Co. Pty. Ltd.	0·94	0·75	14·61	12·75	1·08	1·37	2·71	3·38	18·40	17·50	5 11 9	5 15 0	,,
1545	Mt. Clear Bonedust‡ ..	Bailey Bros., Ballarat ..	3·40	3·00	..	..	..	..	..	..	17·80	18·00	6 4 8	7 0 0	Ballarat
1546	Mt. Lyell No. 1 Superphosphate	Mt. Lyell Mining and Railway Co. Ltd.	..	..	17·49	17·00	0·64	0·50	0·97	0·50	19·10	18·00	5 3 3	5 0 0	Geelong
1547	Sickle Bone and Superphosphate (A)	Cuming, Smith, and Co. Pty. Ltd.	1·60	1·50	12·95	8·50	0·91	3·25	3·77	5·25	17·63	17·00	5 15 0	6 10 0	Hamilton
1548	Elsworth's Bone Fertilizer and Superphosphate	W. R. Elsworth, Ballarat	1·61	1·00	9·55	8·00	2·59	3·00	7·44	6·00	19·58	17·00	5 17 8	6 5 0	Ballarat
1550	Wischer's Superphosphate No. 1	Wischer and Co. Pty. Ltd.	..	..	18·10	17·00	0·50	0·50	0·52	0·50	19·12	18·00	5 5 7	5 0 0	,,
1551	Wischer's Superphosphate and Bone No. 2	,, ,, ,,	0·93	0·75	13·89	12·75	0·84	1·13	3·26	3·62	17·99	17·50	5 8 4	5 15 0	,,

* Fine bone, 47·10 per cent.; coarse bone, 52·90 per cent. Guaranteed Fine bone, 55 per cent.; coarse bone, 45 per cent.
† Fine bone, 20·10 per cent.; coarse bone, 79·90 per cent. Guaranteed—Fine bone, 33 per cent.; coarse bone, 67 per cent.
‡ Fine bone, 44·20 per cent.; coarse bone, 55·80 per cent. Guaranteed—Fine bone, 30 per cent.; coarse bone, 70 per cent.

Figures in parentheses represent nitrogen as ammonia.

List Showing Results of Analysis of Samples of Artificial Fertilizers Collected in Victoria (Season 1917–18) under the Provisions of Sections 16 and 17 of the Fertilizers Act 1915 (No. 2652)—*continued*.

Label No.	Description of Manure.	Manufacturer or Importer.	Nitrogen.		Phosphoric Acid. Water Soluble.		Phosphoric Acid. Citrate Soluble.		Phosphoric Acid. Citrate Insoluble.		Phosphoric Acid. Total.		Price asked for the Manure per Ton.	Value of the Manure per Ton calculated on result of Analysis.	District in which Sample was Obtained.
			Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.			
			%	%	%	%	%	%	%	%	%	%	£ s. d.	£ s. d.	
1552	Mt. Lyell Bone and Superphosphate No. 1	Mt. Lyell Mining and Railway Co. Ltd.	1·67	1·50	10·18	8·50	1·55	3·25	6·64	5·25	18·37	17·00	5 13 7	6 10 0	Ballarat
1555	Wischer's Superphosphate and Bone No. 2	Wischer and Co. Pty. Ltd.	0·86	0·75	14·31	12·75	0·63	1·13	2·51	3·62	17·45	17·50	5 5 10	5 15 0	Geelong
1556	Federal Bone Fertilizer and Superphosphate (BS No. 1)	Australian Explosives and Chemical Co.	1·55	1·50	10·96	8·50	2·02	1·75	5·31	6·75	18·29	17·00	5 13 11	6 10 0	,,
1557	Wischer's Superphosphate No. 1	Wischer and Co. Pty. Ltd.	..	..	16·59	17·00	0·46	0·50	0·71	0·50	17·76	18·00	4 17 11	5 0 0	..
1558	Elsworth's Bone Fertilizer ..	W. R. Elsworth, Ballarat	3·25	2·00	1·15	..	3·35	6·00	14·15	11·00	18·65	17·00	6 1 6	6 15 0	,,
1560	Sickle Bone Fertilizer and Superphosphate, Mixed (A)	Cuming, Smith, and Co. Pty. Ltd.	1·88	1·50	11·54	8·50	1·21	3·25	3·86	5·25	16·61	17·00	5 13 1	6 10 0	,,
1561	Mt. Lyell No. 1 Superphosphate	Mt. Lyell Mining and Railway Co. Ltd.	..	..	18·01	17·00	0·79	0·50	1·07	0·50	19·87	18·00	5 7 0	5 0 0	,,
1562	Sickle Florida Superphosphate	Cuming, Smith, and Co. Pty. Ltd.	..	..	17·37	17·00	0·52	0·50	0·66	0·50	18·55	18·00	5 1 7	5 0 0	Warrnambool
1563	Sickle Bone and Superphosphate, Mixed (A)	,, ,, ,,	1·66	1·50	12·14	8·50	1·05	3·25	3·82	5·25	17·01	17·00	5 12 3	6 10 0	,,
1564	Sickle Special Mixture* ..	,, ,, ,,	(2·00)	(2·40)	14·80	13·60	0·68	0·40	0·50	0·40	15·98	14·40	11 3 11	Not ascertained	Mildura
1566	Sickle Bone and Superphosphate (A)	,, ,, ,,	1·73	1·50	11·49	8·50	1·49	3·25	4·70	5·25	17·68	17·00	5 15 1	6 10 0	Geelong
1567	Elsworth's Bone Fertilizer ..	W. R. Elsworth, Ballarat	3·38	2·00	0·92	..	3·25	6·00	14·18	11·00	18·35	17·00	6 1 9	6 15 0	,,
1568	Sickle Florida Superphosphate	Cuming, Smith, and Co. Pty. Ltd.	..	..	17·83	17·00	0·35	0·50	0·20	0·50	18·38	18·00	5 2 10	5 0 0	Nathalia
1569	Wischer's No. 1 Superphosphate	Wischer and Co. Pty. Ltd.	..	..	17·56	17·00	1·74	0·50	0·80	0·50	20·10	18·00	5 8 10	5 0 0	,,
1570	Mt. Lyell Market Garden Manure	Mt. Lyell Mining and Railway Co. Ltd.	3·97 (1·16)	4·00 (1·00)	8·54	7·65	0·76	0·22	2·90	2·32	12·20	10·19	6 7 0	7 0 0	,,
1571	Federal Superphosphate O.S.	The Australian Explosives and Chemical Co.	..	..	17·95	17·00	1·00	0·50	0·30	0·50	19·25	18·00	5 7 1	5 0 0	,,

* Containing 5·20 per cent. potash. Guaranteed—4·80 per cent.
Figures in parentheses represent nitrogen of ammonia.

List Showing Results of Analysis of Samples of Artificial Fertilizers Collected in Victoria (Season 1917–18) under the Provisions of Sections 16 and 17 of the Fertilizers Act 1915 (No. 2652)—*continued.*

Label No.	Description of Manure.	Manufacturer or Importer.	Nitrogen.		Phosphoric Acid.								Price asked for the Manure per Ton.	Value of the Manure per Ton calculated on result of Analysis.	District in which Sample was Obtained.
					Water Soluble.		Citrate Soluble.		Citrate Insoluble.		Total.				
			Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.	Found.	Guaranteed.			
			%	%	%	%	%	%	%	%	%	%	£ s. d.	£ s. d.	
1572	Mt. Lyell No. 1 Superphosphate	Mt. Lyell Mining and Railway Co. Ltd.	..	..	17·43	17·00	1·38	0·50	0·83	0·50	19·64	18·00	5 6 4	5 0 0	Nathalia
1573	Mt. Lyell No. 1 Bone Fertilizer and Superphosphate	,, ,, ,,	1·63	1·50	8·89	8·50	2·04	3·25	4·77	5·25	15·70	17·00	5 1 8	6 10 0	,,
1577	Sickle Bone Fertilizer and Superphosphate, Mixed (A)	Cuming, Smith, and Co. Pty. Ltd.	1·41	1·50	12·08	8·50	2·61	3·25	3·17	5·25	17·86	17·00	5 13 8	6 10 0	Ballarat
1578	Sickle Florida Superphosphate	,, ,, ,,	..	..	18·28	17·00	0·94	0·50	0·45	0·50	19·67	18·00	5 8 9	5 0 0	,,
1579	Mt. Clear Bonedust* ..	Bailey Bros., Mt. Clear, Ballarat	2·98	3·00	..	..	..	..	..	..	17·35	18·00	5 16 10	7 0 0	,,
1580	Federal Superphosphate ..	Australian Explosives and Chemical Co.	..	..	17·46	17·00	1·15	0·50	1·50	0·50	20·11	18·00	5 6 3	5 0 0	Ringwood
1581	Mt. Lyell No. 1 Superphosphate	Mt. Lyell Mining and Railway Co. Ltd.	..	..	17·62	17·00	0·70	0·50	0·99	0·50	19·31	18·00	5 4 4	5 0 0	,,
1582	Wischer's No. 1 Superphosphate	Wischer and Co. Pty. Ltd.	..	..	17·17	17·00	0·70	0·50	0·67	0·50	18·54	18·00	5 1 5	5 0 0	,,
1583	Sickle Florida Superphosphate	Cuming, Smith, and Co. Pty. Ltd.	..	..	17·01	17·00	0·67	0·50	0·74	0·50	18·42	18·00	5 0 5	5 0 0	,,
1584	Rohs' Bonedust and Blood Mixed	P. Rohs Pty. Ltd., Bendigo	7·86	6·00	..	..	3·19	6·50	6·58	5·00	9·77	11·50	8 16 6	8 10 0	Bendigo
1585	Rohs' Bonedust†	,, ,, ,,	4·12	4·00	..	..	..	..	..	..	19·42	18·00	7 5 1	7 0 0	,,
1586	Elsworth's Bone Fertilizer and Superphosphate	W. R. Elsworth, Ballarat	1·14	1·00	11·30	8·00	3·40	3·00	3·49	6·00	18·19	17·00	5 10 4	6 5 0	Ballarat
1587	Mt. Lyell No. 1 Superphosphate	Mt. Lyell Mining and Railway Co. Ltd.	..	..	16·69	17·00	0·77	0·50	0·48	0·50	17·94	18·00	4 18 11	5 0 0	,,
1588	Whitehorse Bonedust‡ ..	F. W. Richards, Warrenheip	3·26	2·50	..	..	..	..	..	..	19·23	17·00	7 0 0	6 0 0	Sebastopol
1590	Wischer's Superphosphate No. 1	Wischer and Co. Pty. Ltd.	..	..	18·63	17·00	1·11	0·50	0·60	0·50	20·34	18·00	5 11 7	5 0 0	Geelong

* Guaranteed 30 per cent. fine bone. Containing 44·70 per cent. fine bone.
† Guaranteed 55 per cent. fine bone. Containing 52·30 per cent. fine bone.
‡ Guaranteed 60 per cent. fine bone. Containing 76·90 per cent. fine bone.

List Showing Results of Analylis of Samples of Artificial Fertilizers Collected in Victoria (Season 1917–18) under the Provisions of Sections 16 and 17 of the Fertilizers Act 1915 (No. 2652)—*continued.*

Label No.	Description of Manure.	Manufacturer or Importer.	Nitrogen. Found.	Nitrogen. Guaranteed.	Phosphoric Acid. Water Soluble. Found.	Water Soluble. Guaranteed.	Citrate Soluble. Found.	Citrate Soluble. Guaranteed.	Citrate Insoluble. Found.	Citrate Insoluble. Guaranteed.	Total. Found.	Total. Guaranteed.	Price asked for the Manure per Ton.	Value of the Manure per Ton calculated on result of Analysis.	District in which Sample was Obtained.
			%	%	%	%	%	%	%	%	%	%	£ s. d.	£ s. d.	
1591	Sickle Bone Fertilizer and Superphosphate (A)	Cuming, Smith, and Co. Pty. Ltd.	1·81	1·50	11·72	8·50	2·65	3·25	2·84	5·25	17·21	17·00	5 16 10	6 10 0	Geelong
1592	Sickle Florida Superphosphate	,, ,, ,,	..	..	16·90	17·00	0·77	0·50	0·88	0·50	18·55	18·00	5 0 6	5 0 0	Dandenong
1595	Sickle Bone and Superphosphate, Mixed (A)	,, ,, ,,	1·60	1·50	11·88	8·50	2·92	3·25	3·16	5·25	17·96	17·00	5 16 11	6 10 0	,,
1596	Sickle Market Garden Manure ..	,, ,, ,,	3·86 (1·12)	4·00 (1·00)	9·58	7·65	2·57	0·22	2·08	2·32	14·23	10·19	6 17 3	7 0 0	,,
1574	Gardiner's Bone and Superphosphate	Geo. Gardiner and Co. Pty. Ltd.	1·06	1·39	2·35	8·00	6·74	3·20	8·40	5·80	17·49	17·00	6 7 6	4 11 3	Geelong
1575	Gardiner's No. 1 Magic Bone Fertilizer	,, ,, ,,	1·30	2·00	..	..	4·72	2·00	13·57	15·00	18·29	17·00	6 5 0	4 9 3	,,

Figures in parentheses represent nitrogen as ammonia

SCALE OF CHARGES FOR HANDLING, FREEZING, SHIPPING, ETC., GOVERNMENT COOL STORES.

Produce.	Treatment, &c.	Rate.	Storage, per Package, per Week following, or Portion of Week.
		s. *d.*	*s.* *d.*
Butter or Milk ..	Per box,, for the first week or any portion thereof, including handling, freezing, and shipping oversea	0 5	0 $1\frac{1}{2}$
Butter or Milk ..	Per box, including above, for Inter-State, export, or storage	0 3	0 $1\frac{1}{2}$
Cheese	Per case of 1 cwt., or of 120 lbs., for first week or any portion thereof	0 9	0 5
Eggs	Per case of 36 dozen, for first week or any portion thereof	0 $2\frac{1}{4}$	0 $2\frac{1}{4}$
Eggs	Per case of 25 dozen, for first week or any portion thereof	0 $1\frac{1}{2}$	0 $1\frac{1}{2}$
Eggs	Per butter box, for first week or portion thereof	0 1	0 1
Eggs	Per dozen, for export, including grading, packing, case, and fourteen days' storage	0 $1\frac{1}{2}$	0 $1\frac{1}{2}$
Egg Pulp ..	Per 4-gallon tin, per week	0 $0\frac{3}{4}$	0 $0\frac{3}{4}$
Egg Pulp ..	Per case of two tins, per week	0 $1\frac{1}{2}$	0 $1\frac{1}{2}$
Poultry, Chickens, Fowls, Ducks, Geese, and Turkeys	Per case, including freezing, handling, shipping, and fourteen days' storage*	0 $11\frac{1}{2}$	0 $1\frac{1}{2}$
Rabbits (Furred) ..	Per crate of 24, including freezing, handling, shipping, and fourteen days' storage*	0 $11\frac{1}{2}$†	0 $1\frac{1}{4}$
Rabbits (Furred) ..	Per crate of 24, hard frozen, including handling, shipping, and fourteen days' storage	0 $8\frac{1}{2}$	0 $1\frac{1}{4}$
Rabbits (Skinned, including ship's stores)	Per crate, including as per Furred Rabbits*	0 $11\frac{1}{2}$†	0 $1\frac{1}{4}$
Rabbits (Skinned, including ship's stores)	Per crate, hard frozen	0 $8\frac{1}{2}$	0 $1\frac{1}{4}$
Hares	Per crate of twelve, including as per Furred Rabbits*	1 3†	0 2
			per lb.
Mutton	Per carcass, including handling, freezing, loading, bagging, and 21 days' storage (cutting extra)‡	1 0	0 $0\frac{1}{24}$
Mutton	Per carcass, hard frozen, including handling and loading, first week	0 4	0 $0\frac{1}{24}$
Lamb	Per carcass, including handling, freezing, loading, bagging, and 21 days' storage (cutting extra)‡	0 9	0 $0\frac{1}{24}$
Lamb	Per carcass, hard frozen, including handling and loading, first week	0 3	0 $0\frac{1}{24}$
Meat (Beef, Pork, Veal, Sundries)	Per lb., including handling, bagging, freezing, loading, and 21 days' storage‡	0 $0\frac{1}{3}$	0 $0\frac{1}{24}$
Meat (Beef, Pork, Veal, Sundries)	Frozen, per lb., including handling, loading, and 21 days' storage	0 $0\frac{1}{8}$	0 $0\frac{1}{24}$

* Exporters have to grade, pack, provide packages, and deliver to chamber door.

† This rate to apply to freshly-packed or chilled rabbits and hares which require a second handling for freezing before storage.

‡ Wraps and wrapping material to be provided by owner.

Scale of Charges for Handling, Freezing, Shipping, etc., Government Cool Stores—*continued.*

Produce.	Treatment, &c.	Rate.	Storage, per Package, per Week following, or Portion of Week.
		s. d.	*s. d.* per package.
Meat	Kidneys, packed in cases of twenty dozen, including case	1 0	0 1
Meat	Kidneys, packed in cases of ten dozen, including case	0 9	0 0½
Fruit	Per case, for handling, transferring, assembling, &c., without storage	0 2	..
Fruit	Per case, for export, from date of receiving and one week's storage	0 3	0 1¼
Fruit	Per case, for storage, per week, or any portion thereof (minimum charge, 3d.)	0 1¼	0 1¼

Notes.

Extra labour incurred in double bagging of mutton or lamb will be charged for at the rate of ½d. per carcass. Quarters of beef, carcasses of veal and pork, 1d. each.

Weighing of mutton, lamb, pork, veal, beef, &c., up to 10 per cent. included in above scale of charges. Additional weighing will be charged for at the rate of ¼d. per carcass of mutton, lamb, veal, pork, or piece of beef; 1d. for quarters of beef.

Re-branding of cases, &c., including removal of other brands, ½d. extra.

Butter, &c., arriving at the Cool Stores, and taken delivery of the same day, before being put in freezing-rooms, will be charged 1d. per case.

R. CROWE,
Exports Superintendent.

7th August, 1918.

VICTORIAN RAINFALL.

Third Quarter, Year 1918.

District.	—	July.	August.	September.	Quarter.
		Points.	Points.	Points.	Points.
Mallee North	District Mean.. ..	66	140	29	235
	Normal	94	132	147	373
	Per cent. above normal	..	6	..	..
	„ below „	30	..	80	37
Mallee South	District Mean.. ..	60	186	45	291
	Normal	128	139	166	433
	Per cent. above normal	..	34	..	..
	„ below „	53	..	73	33
North Wimmera ..	District Mean.. ..	119	187	37	343
	Normal	172	175	198	545
	Per cent. above normal	..	7	..	..
	„ below „	31	..	81	37
South Wimmera ..	District Mean.. ..	171	208	63	442
	Normal	219	223	227	669
	Per cent. above normal	..	..	..	..
	„ below „	22	7	72	34

VICTORIAN RAINFALL—*continued.*

District.	—	July.	August.	September.	Quarter.
		Points.	Points.	Points.	Points.
Lower Northern Country	District Mean	72	297	63	432
	Normal	160	171	176	507
	Per cent. above normal	..	74	..	..
	„ below „	55	..	64	15
Upper Northern Country	District Mean	106	298	55	459
	Normal	191	205	199	595
	Per cent. above normal	..	45	..	..
	„ below „	45	..	72	23
Lower North-East ..	District Mean	228	500	162	890
	Normal	313	273	273	859
	Per cent. above normal	..	83	..	4
	„ below „	27	..	41	..
Upper North-East ..	District Mean	457	504	271	1,232
	Normal	475	452	442	1,369
	Per cent. above normal	..	12	..	..
	„ below „	4	..	39	10
East Gippsland ..	District Mean	403	231	208	842
	Normal	235	206	285	726
	Per cent. above normal	71	12	..	16
	„ below „	..	..	27	..
West Gippsland ..	District Mean	473	177	256	906
	Normal	291	307	368	966
	Per cent. above normal	63	..	..	..
	„ below „	..	42	30	6
East Central	District Mean	321	322	395	1,038
	Normal	282	289	345	916
	Per cent above normal	14	11	14	13
	„ below „	..	..	..	..
West Central	District Mean	252	271	196	719
	Normal	198	206	280	684
	Per cent. above normal	27	32	..	5
	„ below „	..	..	30	..
North Central ..	District Mean	256	318	139	713
	Normal	271	275	291	837
	Per cent. above normal	..	16	..	..
	„ below „	6	..	52	15
Volcanic Plains ..	District Mean ..	266	213	154	633
	Normal	227	235	289	751
	Per cent. above normal	17	..	..	..
	„ below „	..	9	47	16
West Coast	District Mean	393	273	232	898
	Normal	333	318	329	980
	Per cent. above normal	18	..	..	..
	„ below „	..	14	29	8

N.B.—100 points = 1 inch.

ORCHARD AND GARDEN NOTES.

E. E. Pescott, F.L.S., Pomologist.

The Orchard.

As a preventive against codlin moth, apple and pear trees should be sprayed with arsenate of lead whenever there is danger from the prevalence of the moth. One of the secrets of success in codlin moth spraying is the destruction of as many as possible of the insects of the first brood. Thus, if particular care is given to the early sprayings, keeping the fruit covered with spray for a month or six weeks after setting, this result is easily accomplished. Some growers prefer to gather all fruit infected by the first brood, spraying only for the second and later broods. Even if all the fruits attacked are gathered, which very rarely happens, the grower suffers from the loss of fruit, which he can ill afford, unless his crop be a heavy one.

Another feature for consideration is the fact that the presence of any arsenical spray on the foliage is responsible for the destruction of the pear and cherry slug, root-borer beetle, and all forms of leaf-eating insects.

Spraying the cherries for the slug will now be necessary. Arsenate of lead may be used, provided the fruit is not far advanced. Hellebore, and also tobacco water, are effective against this pest.

Cultivation.

All orchard soils should be kept well worked during the summer months. It is very essential that the trees should have an abundant supply of moisture during the whole of the growing season. This will mean an increased supply of fruit buds for the next season, consequently the frequent summer cultivation of the soil will be a necessity if the health and vigour of the trees are to be maintained.

Excessive transpiration is often the cause of loss of young trees and of new grafts. They are found to part with a large amount of moisture, and are not able to obtain or retain sufficient for their nourishment; they then very soon wither and die. The soil around these should always be kept well stirred; they may also be given a good straw or grass mulching, and an occasional overhead sprinkling will greatly benefit them.

The planting out of citrus trees may be continued, sheltering the tender plants from winds with hessian or breaks of scrub.

The general aims in summer cultivation should be to maintain a good loose earth mulch during the whole season, and to keep down all weeds and useless orchard growths.

Pruning.

Summer pruning may now be commenced, particularly on apple, pear, and plum trees. The removal or reduction of surplus leader growths, the shortening of unduly long laterals, and the thinning out of crowded shoots, will all tend to strengthen other parts of the tree and to increase the development of new fruit buds.

Vegetable Garden.

Tomatoes will require much attention at this time of the year. If the plants have been well looked after, they should be making vigorous growth. It will be to advantage to tie the plants to stakes, training them to two or three main growths, and pinching out all laterals as they come.

The plants should be well watered, and occasionally a handful of bonedust and blood manure mixed should be forked in around the roots. Where stable manure is used, it should be used as a mulch, forking it in every three or four weeks, and making a fresh mulch.

All plants of the cucumber and melon family should now be con stantly supplied with ample water. Pinch out unnecessary lateral growths, and also the terminals.

The following seeds may now be sown:—French beans, cabbage and cauliflower for winter crops, parsnip, lettuce, and celery.

The side sheets of celery plants should be removed, afterwards earthing up the plants. Asparagus beds should be top-dressed, and allowed to grow without any more cutting. The vegetable beds will need frequent forking and hoeing to keep the soil sweet, and to keep down all weeds.

Flower Garden.

Plant out dahlias this month; tubers early, and plants grown from cuttings for exhibition blooms later in the month. Water well at planting, and keep well cultivated afterwards.

Rose bushes and beds may be given a good mulch with light stable manure, straw, grass, or lawn clippings. The beds should be kept rather dry, so as to allow the plants to rest before the autumn period of growth.

Sow seeds of cosmos, asters, zinnia, balsams, cockscomb, and other late summer and autumn blooming annuals.

Cut down delphiniums that have yielded their first crop of flowers, so as to allow a succession of flowers to come.

Daffodil, hyacinth, tulip, ranunculus, anemone, and other bulbs and tubers may be taken up and stored; while gladioli corms may still be planted.

The garden must be kept well watered and cultivated, so as to tide the plants over the hot and dry season.

REMINDERS FOR JANUARY.

LIVE STOCK.

Horses.—*Stabled.*—Over-stimulating and fattening foods should be restricted. Water should be allowed at frequent intervals. Rub down on coming into stables in an overheated condition. Supply a ration of greenstuff, where possible, to all horses. *Brood mares* should be well fed on succulent food if available; otherwise, oats and bran should be given. *Foals* may with advantage be given oats to the extent of 1 lb. for each month of age daily. Provision should be made for shade shelter for paddocked horses.

CATTLE.—Provide succulent fodder and plenty of clean water and shade. Provide "lick" in trough, consisting of salt 20 lbs., lime 20 lbs., superphosphate 5 lb., and sulphate of iron 1 lb. Limewash the cow bails, it helps to keep down flies. Provide calves, if possible, with good grass run, or lucerne hay or oats in a trough.

PIGS.—Supply short bedding in warm, well-ventilated styes. Keep styes clean and dry, and feeding troughs clean and wholesome. Sows may now be turned into grass run. Sows suckling young should be well fed to enable them to produce plenty of milk. Give young pigs pollard and skim milk in separate trough as soon as they will take it, and keep them fattening from the start to get them off as early as possible. Give a tablespoonful of bone meal or superphosphate per 100 lbs. live weight in food daily. If pigs are lousy, dress with kerosene emulsion or sulphur and lard, rubbing well into crevices of skin, and disinfect styes. Pig breeding and feeding should be very profitable for a long time to come, and it should be safe to launch out now. Plenty of water should be available for them to wallow in in hot weather.

SHEEP.—Ewes, after a season such as this, will come in season well to time. Merino and fine comebacks, November and December; crossbreds, January and February; pure British breeds, February and March. Be sure of ample rams running with them. Join best rams first. Breed from every good ewe possible. Keep in view wool production as well as lamb and mutton. Meat and wool will always be amongst the foremost commodities in demand. Two-tooth ewes, if well grown, can be bred from, but they should be well treated throughout. Use rams with width and substance, and never inferior-fleeced ones. Rams work best at night and early morning. With large paddocks it may be necessary to yard occasionally. Purgative drenches, worm pills, &c., must be given to all lambs, weaners, or grown sheep showing unhealthy discharge, and in persistent cases, second and third doses. Healthy sheep are rarely fly blown.

POULTRY.—Separate the sexes; the cockerels should now be fattened and marketed. Grade the young stock according to age and size, otherwise the younger birds will not thrive. Avoid overcrowding. Do not force pullets too much with animal food; build them up with a good variety of food, but avoid maize, and give but little meat. Increase the green food; thoroughly spray houses and perches with an emulsion of kerosene and soapsuds, or a solution of carbolic acid 1 in 60. Keep water vessels in shady spot, and renew water twice daily. Moisten dust bath.

CULTIVATION.

FARM.—Get all crops harvested and stacked as soon as possible. Horse-hoe maize, potatoes and other summer crops. See to insurance of stacks of grain and hay.

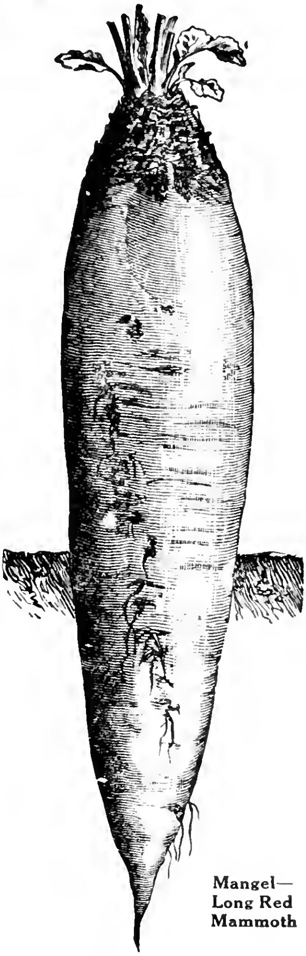
ORCHARD.—Keep the soil well scarified and weed free. Cultivate after irrigation or rain. Do not allow the surface to become caked. Spray against codlin moth, pear slug, vine caterpillar, and woolly aphis. Summer prune strong growing shoots and laterals.

VEGETABLE GARDEN.—Plant out all seedlings, when ready, from former sowings. Stir and mulch the surface. Dig each plot as it becomes vacant. Sow seeds of cauliflower, cabbage, peas, French beans, Kohl Rabi, &c.

FLOWER GARDEN.—Keep the soil moist and cool by watering, hoeing, and mulching. Stake tender and lengthy plants. Water and shade young plants. Sow pansy, Iceland poppy, cosmos, aster, &c.

VINEYARD.—Summer bud or *Yema* grafting may be practised in January, though February is the usual month. (See *Journals*, January and February, 1916.) This is the slackest month in un-irrigated vineyards—all ordinary work should be completed before Christmas. It is only exceptional operations, such as scarifying after rain, sulphuring in case of odium, or spraying for downy mildew (see *Journal* for November, 1917), that must be carried out. In irrigated vineyards the application of water, and the cultivation it necessitates, require attention.

Cellar.—Fill up regularly and keep cellar as cool as possible. Towards end of month commence to make preparations for the coming vintage.



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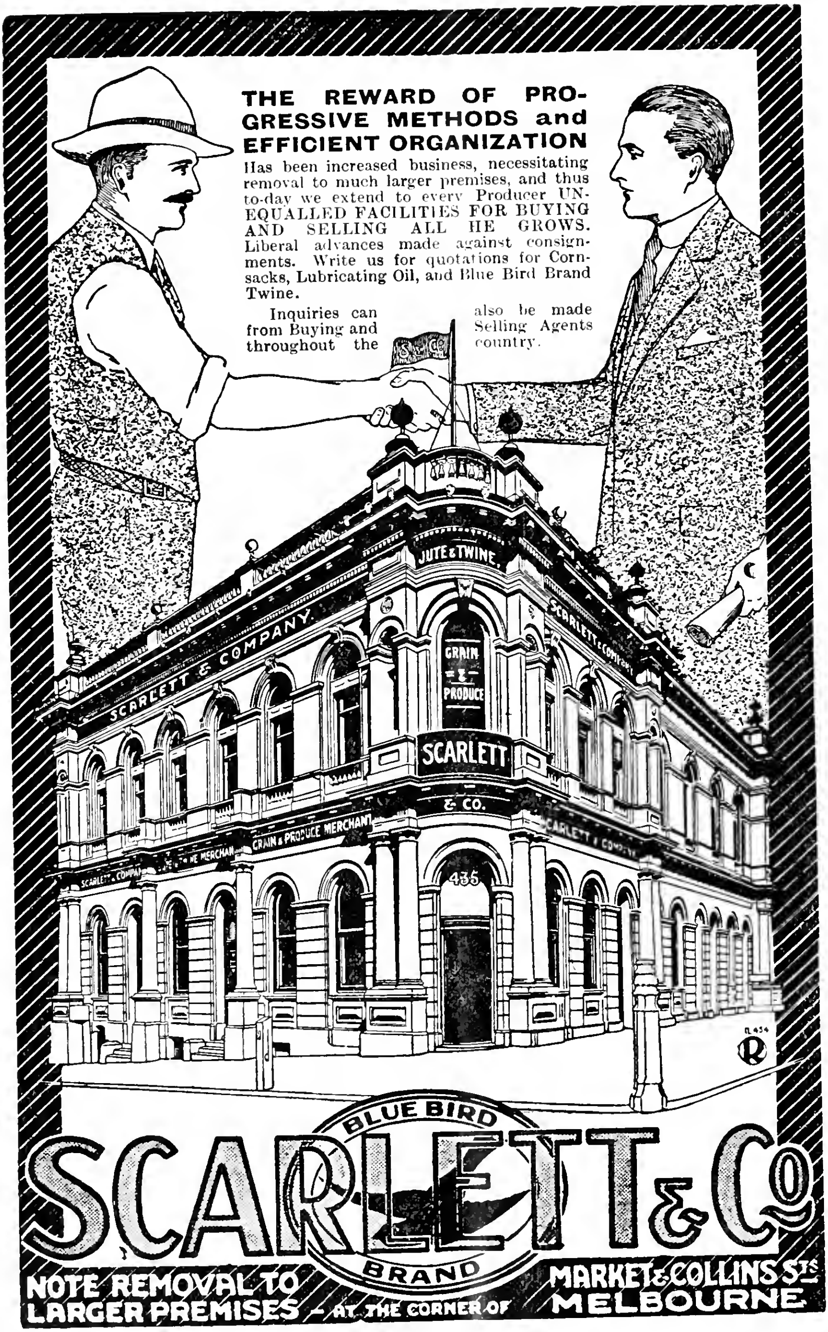
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